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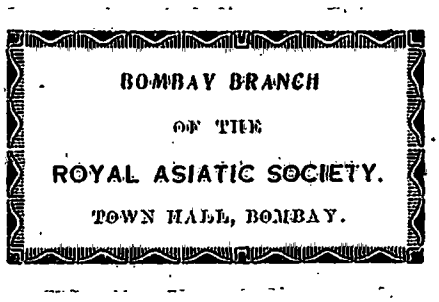

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ANNUAL REPORT

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OF THE

IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH

1939-40

PUBLISHED BY THE MANAGER OF PUBLICATIONS, DELHI
PRINTED BY THE MANAGER, GOVERNMENT OF INDIA PRESS, NEW DELHI,
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CONTENTS

PART I.—GENERAL

	Page.
CHAPTER I—	
1. Administration	1
2. Secretariat of the Council	1
3. Constituent Indian States	1
4. Meetings—	
(*i*) Annual General meeting	1
(*ii*) Governing Body	1
(*iii*) Advisory Board	1
(*iv*) Committees	1
5. Finance and Accounts	2
6. Agricultural Produce Cess Act, 1940	3
7. Research Personnel	4
CHAPTER II—	
Minor Administrations and non-constituent States	4
CHAPTER III—	
International Congresses and Conferences	5

PART II.—RESEARCH

SECTION I.—AGRICULTURE

CHAPTER I—	
Economic Work on crops—	
A. Rice	6
B. Wheat	11
C. Fruit	13
D. Fibres	19
E. Tobacco	21
F. Oilseeds	23
G. Millets	26
H. Other Cereals	28
I. Potatoes	28
CHAPTER II—	
Dry Farming Research	29
CHAPTER III—	
Research on Crop Production—Soils and Fertilisers	31
CHAPTER IV—	
Agricultural meteorology	37
CHAPTER V—	
Plant breeding and genetics	37
CHAPTER VI—	
Plant diseases and pests	41
CHAPTER VII—	
Agricultural economics	42
CHAPTER VIII—	
Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India	43
CHAPTER IX—	
Fodder crops and grasses	43

PAGE

SECTION II.—SUGAR

CHAPTER I—

Sugar Research—

(i) Standing Sugar Committee 45
(ii) All India Sugar Conference 45
(iii) Indian Central Sugar Committee 45
(iv) Work on Insect Pests 46
(v) Biological control of sugar pests 46
(vi) Funds for sugar research 46
(vii) Publications 46
(viii) Sugar marketing survey 47

CHAPTER II—

Imperial Institute of Sugar Technology—

(i) Industrial and Technical 47
(ii) Research and Experiments—
(a) Division of sugar engineering. 49
(b) Division of sugar technology 50
(c) Division of sugar chemistry 50
(d) Division of Physical chemistry 50
(e) Division of Biochemistry 51
(f) Statistical Section 51
(iii) Sugar Research and Testing Station, Bihari 51
(iv) Bureau of Sugar Standards 51
(v) Cattle Feed Experiments 52
(vi) Statistical 53
(vii) Training in sugar technology 54
(viii) Employment Bureau 54
(ix) Publications and Library 54

SECTION III.—ANIMAL HUSBANDRY

CHAPTER I—

General improvement of Cattle in India. 54

CHAPTER II—

(i) Visits of the Animal Husbandry Commissioner with the Government of India to certain Provinces and States . 56
(ii) International Veterinary Congress, Zurich and Interlaken 1938 56
(iii) Meetings of Committees on the Animal Husbandry side . . 56

CHAPTER III—

Animal Diseases 56

CHAPTER IV—

Animal Breeding. 64

CHAPTER V—

Animal Nutrition. 71

CHAPTER VI—

Dairying. 74

CHAPTER VII—

Animal Industry 78

CHAPTER VIII—

Pisciculture. 80

PART III.—MISCELLANEOUS.

	PAGE
CHAPTER I—	
Statistical Section	82
CHAPTER II—	
Agricultural Marketing—	
(*i*) Surveys	82
(*ii*) Grading and standardisation	83
(*iii*) Quality Control	83
(*iv*) Standards of weight	83
(*v*) Adulteration	84
(*vi*) Marketing legislation	84
(*vii*) Market news—Price control	84
(*viii*) Futures trading	84
(*ix*) Price Insurance	85
(*x*) Trade conferences	85
(*xi*) Miscellaneous	85
(*xii*) Cold Storage	85
CHAPTER III—	
Publications—	
(*i*) Journals	86
(*ii*) Preparation of critical monographs on Indian research work	87
(*iii*) Monograph, Bulletins and other publications	87
(*iv*) Supply of publications	89
(*v*) Editorial Committee and references	89
CHAPTER IV—	
Library—	
(*i*) General	89
(*ii*) Functions of the Library—	
(*a*) Classification and cataloguing	91
(*b*) Circulation	91
(*c*) Reference	91
Appendices :	
I. Governing body, Advisory Board and Secretariat of the Council	93
II. Decisions of the Governing Body	96
III. Recommendations of the Advisory Board	106
IV. Personnel of Standing and *ad hoc* Committees	126
V. Annual Accounts	142
VI. Statement of Expenditure	152
VII. Financial position and allocation of funds	164
VIII. Agricultural Produce Cess Act, 1940.	166
IX. List of research workers	169
X. Recommendations of the Rice Committee	194
XI. Recommendations of the Wheat Committee	197
XII. Recommendations of the Tobacco Sub-Committee	199
XIII. Recommendations of the Crops and Soils Wing	202
XIV. Action taken on the recommendations of the Sugar Committee	205
XV. Publications of the Imperial Council of Agricultural Research	219
XVI. Books and publications received in the Library on exchange basis.	226
XVII. Journals received in the Library	227
Glossary	237

IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH

Report, 1939-40

PART I.—General

CHAPTER I

1. *Administration.*—This is the tenth report of the Imperial Council of Agricultural Research covering the period 1st April 1939 to the 31st March 1940, presented by the Governing Body of the Council under Rule 64 of the Rules and Regulations of the Council.

2. *Secretariat of the Council.*—Mr. P. M. Kharegat, C.I.E., I.C.S., Mr. S. Basu, I.C.S., and Dr. W. Burns, C.I.E., held respectively the posts of the Vice-Chairman, Secretary to the Council and Agricultural Commissioner with the Government of India throughout the year. From the 11th November 1938 to the 10th October 1939, Mr. P. J. Kerr, I.V.S., officiated in the post of Animal Husbandry Commissioner with the Government of India during the absence on leave of Mr. F. Ware, C.I.E., F.R.C.V.S., I.V.S., the permanent incumbent of the post. Mr. Ware returned to duty on the 11th October 1939. The posts of Assistant Agricultural Expert and Assistant Animal Husbandry Expert were held during the period by Rai Bahadur R. L. Sethi, I.A.S., and Mr. H. B. Shahi, respectively.

The composition of the Governing Body, the Advisory Board and the Secretariat of the Council at the end of the year is shown in Appendix I.

3. *Constituent Indian States.*—Hyderabad, Mysore, Baroda, Travancore, Cochin, Bhopal and Kashmir States continued as Constituent States of the Council. The Gwalior Darbar has decided to join the Council and a formal announcement to that effect is expected shortly.

4. *Meetings—Annual General Meeting.*—(i) The Annual General Meeting of the Council was held on the 5th December 1939 at which the Annual Report of the Council and the accounts of the Society for the preceding year were adopted.

(ii) *Governing Body.*—The Governing Body met at Simla on the 20th and 21st July 1939. The matters which they considered and their decisions thereon are summarised in Appendix II.

(iii) *Advisory Board.*—The Advisory Board met twice, at Simla in May and at Delhi in November-December 1939. The meetings were held on 22nd, 26th and 27th May and 29th November and 4th and 5th December 1939. The matters which they considered and their recommendations thereon are summarised in Appendix III.

(iv) *Committees.*—The following Committees appointed by the Governing Body, called 'Standing Committees', met on the dates specified against each:—

Committees	Dates
	May 1939
1. Sugar	18th and 19th
2. Wheat	20th
3. Soil Science	23rd

Committees	Dates
November-December 1939.	
4. Rice	27th and 28th November.
5. Animal Nutrition	29th and 30th November.
6. Fodder and Grazing	30th November.
7. Dairying	30th November.
8. Soil Science	1st December.

The reconstitution of, and certain alterations in the constitution of, the following Standing Committees were approved during the year:—

(1) Sugar, (2) Rice, (3) Fodder and Grazing, (4) Locust Research, (5) Animal Nutrition, (6) Cattle Breeding, and (7) Dairying.

The following Committees, appointed by the Advisory Board and called *'ad hoc'* committees, were constituted and they met on the dates specified against each:—

Committees	Dates
May 1939	
1. Tobacco	16th and 17th
2. Fruit	22nd
3. Fish	
4. Rice	23rd
5. Animal Diseases	
6. Dry Farming	24th
7. Botanical and Physiological	
8. Animal Husbandry	
9. Entomological and Pathological	25th
November-December 1939	
10. Benares Hindu University Scheme	29th November
11. Dry Farming	
12. Jowar	30th November
13. Botany and Physiology	1st December
14. Animal Breeding	
15. Fruit	2nd December
16. Entomological and Pathological	
17. Animal Pests and Diseases	
18. Cardamons	

The personnel of the Standing Committees (including those which were re-constituted) and of the *ad hoc* Committees which met during the year are given in Appendix IV.

5. *Finance and Accounts.*—The following grants were received during the year from the Government of India:—

	Rs.	A.	P.
(*i*) Normal research grant	5,00,000	0	0
(*ii*) Grant for Provincial Marketing Schemes	1,67,000	0	0
(*iii*) Grant from Sugar Excise Fund	2,28,000	0	0
(*iv*) Additional grant for Coorg Inquiry	407	10	0
	8,95,407	10	0

The audited accounts for the year are given in Appendix V. Appendix VI contains details of expenditure incurred up to the end of the year on various research schemes financed by the Council and Appendix VII shows the allocation of funds during the year against receipts—actual and expected.

6. *The Agricultural Produce Cess Act, 1940.*—A measure of far-reaching importance to the Imperial Council of Agricultural Research was the introduction by the Government of India in the Central Legislative Assembly of the Agricultural Produce Cess Bill on March 1, 1940. It was passed with certain amendments by both Houses of the Central Legislature and received the assent of the Governor-General on April 15, 1940. The text of the Act as finally passed is given in Appendix VIII. The object of the Act is to finance the general research programme of the Council by levying a cess of ½ per cent. *ad valorem* on the following commodities:

1. Bones.
2. Bristles.
3. Butter.
4. Cereals, other than Rice and Wheat.
5. Drugs.
6. Fibre for brushes.
7. Fish.
8. Fruits.
9. Ghee.
10. Hides, raw.
11. Manures.
12. Oilcakes.
13. Pulses.
14. Seeds.
15. Skins, raw.
16. Spices.
17. Tobacco, unmanufactured.
18. Vegetables.
19. Wheat.
20. Wheat flour.
21. Wool, raw.

The cost of the Council office, Sugarcane research and the work relating to the organisation of the Marketing of Agricultural Produce will continue to be financed directly from the Central Revenues as before. It is hoped that, placed in a more secure financial position and endowed with a larger and more stable income which would comparatively be unaffected by the financial vicissitudes of the Central Government, the Council will be able

to plan and execute a long term research programme without being continually worried by financial difficulties as in the past. The proceeds of the cess are expected to yield in a normal year about Rs. 14 lakhs.

7. *Research personnel.*—A list of officers paid from the research grants of the Council as on 31st March 1939 is given in Appendix IX.

Security of tenure.—All the schemes financed by the Imperial Council of Agricultural Research are terminable after a specific period. It is not, therefore, possible to avoid the element of temporariness in the service under the Council's schemes. The research workers employed under the Council's schemes are necessarily temporary and in consequence they are to some extent hampered by a feeling of insecurity of tenure. It is admitted on all hands that, in the interest of research, its effects should be mitigated as far as possible. Sir John Russell also examined this question and recommended *inter alia* the institution of a provident fund and the maintenance of a register of satisfactory and efficient research workers whose names could be brought to the notice of Governments, institutions, other organisations and private employers wanting good men. Steps have already been taken by the Council to open a register on the lines recommended by Sir John Russell. The financial implications of the institution of a provident fund are being examined and it is hoped that it will be possible to arrive at a decision shortly.

CHAPTER II.

MINOR ADMINISTRATIONS AND NON-CONSTITUENT STATES.

Agricultural and Veterinary Improvements.

COORG.—Following the report on the Agricultural and Veterinary needs of Coorg by Mr. A. K. Yegnanarayana Aiyer published last year, the Vice-Chairman and the Agricultural Commissioner visited Coorg and made specific suggestions to the Administration regarding the re-organisation of the local Agricultural and Co-operative Departments. Recommendations were also made by the Animal Husbandry Commissioner for the development of Animal Husbandry in the area. Assistance was also afforded in connection with the marketing of honey and oranges.

AJMER-MERWARA.—The Animal Husbandry Commissioner toured in Ajmer in March 1940 when the administration was recovering from the effects of the severest famine of recent years. He advised that attention should be concentrated on the following problems:—

(*a*) Improvement in the milk yield of cows;

(*b*) Cattle breeding (including the importation of some pedigree Mehsana buffalo bulls); and

(*c*) Fodder supplies.

JODHPUR AND ALWAR.—The Animal Husbandry Commissioner visited the States of Jodhpur and Alwar with a view to studying the local breeds of cattle and gave such advice as was sought regarding their improvement.

CHAPTER III.

International Congresses and Conferences.

In response to the invitations from the Seventh International Congress of Genetics, Edinburgh, and the Fourth International Congress on Animal Breeding, Zurich, the Council deputed Rao Bahadur T. S. Venkataraman, Imperial Sugarcane Expert, to attend the former and Mr. H. B. Shahi, Assistant Animal Husbandry Expert of the Council, to attend both of them. Both the Congresses were held in August 1939.

2. While on deputation, Rao Bahadur Venkataraman availed himself of the opportunity to pay visits to various agricultural and experiment stations in the United Kingdom, arranged during the Congress-week and the week before. At the Congress, the photographs and plant material which he had taken from India attracted considerable attention from both botanists and breeders.

3. A detailed account of the Council's participation in the International Veterinary Congress, Zurich and Interlaken, 1938, is given in Section III, Chapter II of this report.

PART II—Research

Section I—Agriculture

CHAPTER I.

Economic work on crops.

A. RICE

Standing Rice Committee—Reconstitution.—It was decided to reconstitute the standing Rice Committee for a further period extending to the 30th September 1941. The Committee met at New Delhi on the 27th and 28th November 1939, and divided itself into two sub-committees, —the Research Sub-committee and the Economic Sub-committee. A statement showing the subjects considered together with a brief summary of the recommendations made in each case will be found in Appendix X.

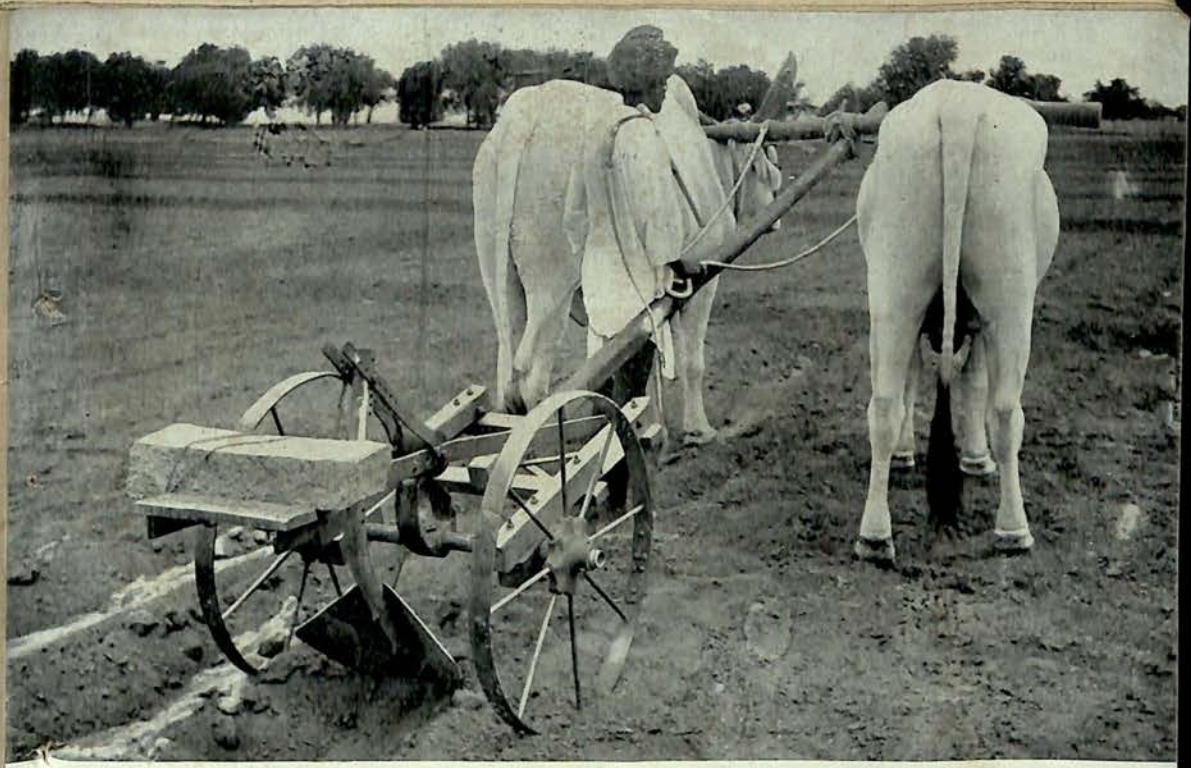
2. Ad hoc *Rice Research Sub-Committee.*—Besides the Standing Rice Committee, an *ad hoc* rice research sub-committee of the Advisory Board met in Simla in May 1939. This committee examined the progress reports for 1937-38 of the research schemes in Bengal, United Provinces, Bihar, Central Provinces and Berar and Orissa and also considered the proposals for extension of the Bihar Rice Research Scheme and the 'quality' in rice scheme at the Indian Institute of Science, Bangalore. The committee recommended that the Bihar scheme be extended upto March 1940 on the existing basis with a view to have the extensions of all rice research schemes terminating at the same time. As regards the scheme of research on 'quality' of crops at the Indian Institute of Science, Bangalore, it was recommended that the scheme need not be extended further. The work was consequently closed down as from 27th June 1939.

The following recommendations regarding the preparation of progress reports were also made by the committee and accepted by the Advisory Board:—

(1) The technical programme for the whole period of the scheme as passed by the Advisory Board should be given in the beginning of the report and any deviations in the programme should be indicated;

(2) A concise summary of the experiments given in a tabulated form is a good method of indicating the results of research and the practice might be followed by all experiment stations; and

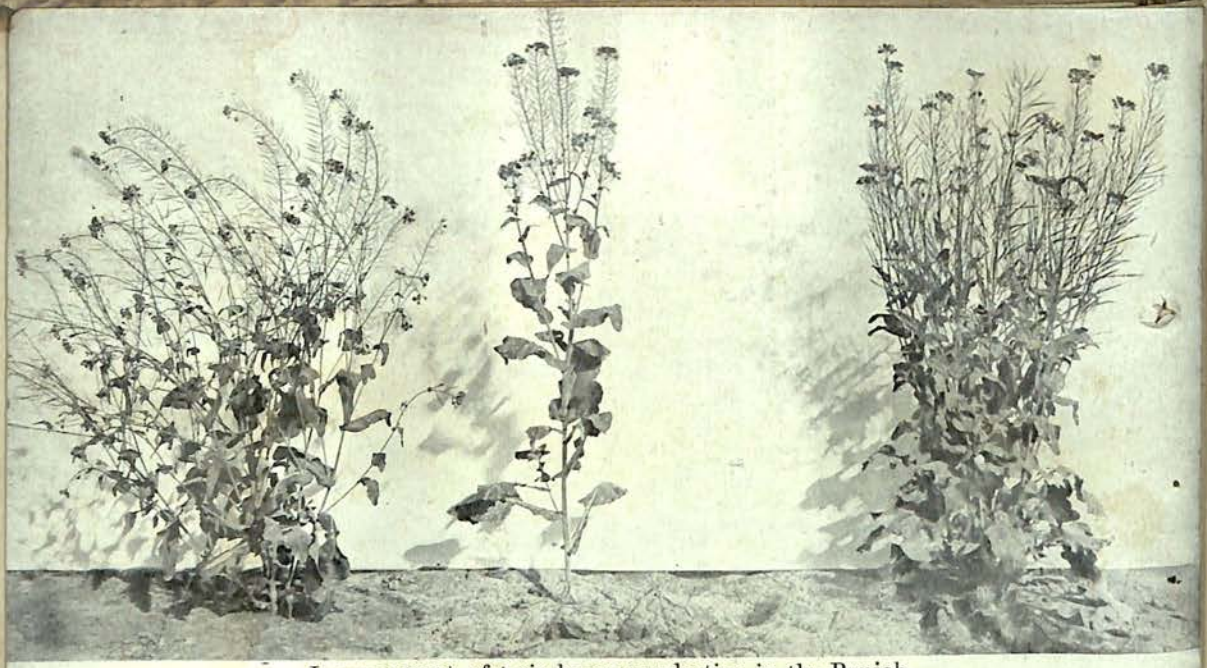
(3) the summary prefixed to the detailed report should contain page references to the text.



Basin lister designed by the Research Engineer at Coimbatore. Cost Rs. 40.

Field worked with basin lister

Cotton: Improved dry farming *versus* local method. Left half : local. Right half : improved



Improvement of *toria* by mass-selection in the Punjab
This is done by roguing out undesirable plants like the first two and growing the third.

Linseed fibre bales 1939

Linseed fibre in village industry

3. *Rice Research Schemes.*—The following outlines the activities undertaken in connection with the Council's Rice Research Schemes.

(i) *Future Policy for Extension Schemes.*—As a result of recommendations made by Sir John Russell the Council had adopted the following principle in regard to its future policy of rice research:—

> "After 1939-40, the Imperial Council should generally limit its assistance for rice research to work on rice genetics, water requirements and manurial experiments, leaving rice breeding to be tackled provincially. The Council's assistance should mainly take the form of grants for senior research staff."

This policy has been generally followed in extending the rice research schemes.

(ii) *New Schemes.*—The Governing Body has allotted funds for a period of three years for three schemes from the Constituent Indian States of Kashmir, Travancore and Baroda. These will commence working in 1940-41.

The Kashmir scheme is designed, among other things, for the selection, isolation and study of the mountain types of rice, *i.e.*, varieties that would grow at an altitude of between 2,000 feet and 5,300 feet and the introduction of foreign varieties, both Indian and exotic. The Travancore scheme contemplates among other things a survey and collection of the rice types of the area with a view to select strains that would be resistant to salt, acid and flood. The Baroda scheme is for the improvement of paddy in Gujarat in general and to investigate the economic possibilities of growing paddy in conjunction with cotton under open field conditions in heavy black soil areas of that region.

A brief statement of the work in progress at the research stations during the year 1938-39 is given below:—

(a) ASSAM—(HABIGANJ DEEP WATER PADDY FARM)

This station completed its fifth year with the year under review. As before, research work has been directed towards the improvement of the deep water *aman* and the *boro* paddies.

Isolation of pure lines, growth vigour, and submergence studies were continued. In a comparison between an early and a late variety the early variety although quicker growing was found to be more affected by the flood. Resistance to submergence gradually improved with the increase in age from 2—6 weeks: it was more or less constant for eight-week plants but a further increase in age had a depressing effect . Breeding work has so far been directed towards obtaining a fine grained *boro* paddy of high yielding capacity by crossing a fine grained *aus* with a high yielding *boro* plant. Genetical studies have been centred in analysing the inheritance of kernel size and awn length. In *aman*, varietal trials have been continued for the last three years. The high flood during the year was of particular use in assessing the relative flood resistance of strains Some strains are definitely promising; A. 192 which has been released for distribution was again found to do well. In *boro* preliminary yield trials have been continued for two years. A number of types giving yield of over 25 per cent over local types have been obtained.

From the economic standpoint the principal achievement of the station so far has been the release for distribution of three promising strains each of *aman* and *boro* in order to meet the growing and persistent demand for improved seed. The following are the quantities:—

	lb.
Aman	49,600
Boro	8,900

(b) Bengal (Chinsurah and Bankura)

Besides investigations on agronomic problems experiments on uniformity trial, border effect and situation were undertaken to arrive at the primary data which helped in improving precision and correctness of the experiments. Yield tests from the preliminary to the final are being carried out on all farms with various selections and a number of variety trials are being carried out at Bankura with regard to a situation test. A number of cultural experiments dealing with the date of planting, age of seedling and seedling numbers are being undertaken.

The work on hybridization with a view to evolve a suitable variety conforming to trade requirements of the export market was continued. The progeny of the Cross *Blue-Rose* × *Latisail* was in the fourth generation in 1938-39. As a result of rigid selection from F_2 and subsequent generations on yield basis, types fixed for all practical purposes have been evolved which gave very promising yields. Further selections are being made from these so as to conform to trade requirements by their grain qualities.

The strains isolated after the opening of the research station at Bankura and Suri Farms have been given out to a few selected cultivators of Bankura and Birbhum Districts. Of these a few types have shown uniformly good results.

In viability and storage experiments, chemical treatment with different strength of copper sulphate and ferrous sulphate solution did not show any effect on the viability.

An experiment to study the effects of "Jhanji" (Algal weed) on the yield of rice did not show any difference between weeded and unweeded plots.

The complex irrigation trial started with two irrigation treatments and two varieties in 1937-38 gave significantly higher yield under irrigation. *Bhasamanik* gave significantly higher yield compared to Patnai *23 Gooaba*. The interaction between the two factors, however was not appreciable.

(c) Bihar (Sabour)

A summary of the major results achieved during the seven years of work is given below:—

A botanical survey of the paddy varieties grown in Bihar (and Orissa) has been completed. From the paddy varieties grown in south Bihar, 200 pure-lines of promising strains have been established, many of which promise higher yields than the existing varieties. Strains have also been selected from other tracts and are now being tested for yield. The advantage of green manuring the paddy crop has been fully established and the results obtained at two stations where this practice has been tried show that an extra profit of Rs. 10 to Rs. 15 per acre can be achieved in this way. Experiments with artificial fertilisers seem to indicate that

where the soil is deficient in phosphates, the use of ammonium sulphate and super phosphate is superior to a composite fertiliser like ammophos or niciphos.

The possibility of growing paddy in saline tracts by pre-treating the seeds and seedlings with minute doses of common salt has been finally established and its practical applicability demonstrated. Further studies to get increased yield, by such pre-treatments, under ordinary growth conditions are also in progress.

The problem of seed storage, in paddy, for considerably long periods has also been solved and it has been established that by simply drying the paddy seeds in hot months of April-May—thereby reducing their moisture content appreciably—and then storing them in air-tight containers, their viability could be maintained for several years.

Hybridization studies were carried and some fixed hybrids with new combinations of definitely desirable characters, which may prove of great economic value, have been evolved. These new hybrids are now being tested for their yielding capacity.

(d) Central Provinces and Berar (Raipur)

The investigations are carried out at Labhandi (Chhattisgarh) and Jubbulpore and Warseoni farms.

The improved strains of early, medium and late varieties were crossed with American *Blue-Rose* to evolve prolific strains with bold and translucent rice for the export market.

The yield of 71 hybrid strains in F_4 generation of the crosses—*Nagkesar* × *Bhondu*, *Nagkesar* × *Budhiabako*, *Nagkesar* × *Gurmatia* and *Nagkesar* × *Luchai* was tested against the parents. The cultures were on the whole uniform for colour of leaf-blade and size of kernels. The best five strains from each of the above families have been retained for further tests. Higher yielding and better quality strains, easily distinguished from wild rice have already been evolved at the station and their seeds are being distributed to the rice-growers. The important hybrids under distribution were obtained from crosses between—

(i) *Budhiabako* × *Parewa No. 19* and
(ii) *Bhondu* × *Parewa No. 22 and No. 116.*

As a result of comprehensive yield trials carried out at the three stations for the last five years 17 strains of uniform quality and improved cropping power have been isolated by selection. They include nine strains of fine and scented varieties. These are now under multiplication and distribution in all the three rice-growing tracts of the province.

A botanical survey of paddy varieties grown in the Central Provinces was continued and morphological characters of 710 varieties have been fully described. A study of root development showed that the root system developed better in the heavier soil *dorsa* than in the lighter soil *matasi* although the yield is better in *matasi* soil. Rice sown broadcast develops a very slender root system. In hulling tests with improved varieties most of the types milled better when reaped five days before their normal time of harvest.

In manurial trials in sandy soil application of 10 lb. nitrogen in the form of ammonium sulphate and 10 lb. phosphoric acid in the form of superphosphate per acre was found most economical and gave the largest profit.

The distribution of seed of improved strains from the combined seed stock of the research station and Labhandi farm amounted to 54,024 lb. as against 53,331 lb. in the previous year.

(e) ORISSA (CUTTACK ETC.)

This is the second year of the working of the scheme. The work in general on the *aman* paddies is carried out at the Cuttack farm but experiments on flood resistance, salt resistance and *dalua* (summer) paddies, which require special environmental conditions for proper growth of the crop, are conducted at Kujang, Sandkud and Mangrajpur (Puri) respectively.

At Cuttack a medium grained fine paddy of medium maturity capable of giving uniformly good performance over a wide area has been evolved. The paddy possesses very good milling qualities and yields 2,700 to 3,000 lbs. per acre. The seeds are being multiplied at all the Departmental Farms for mass distribution. This paddy is numbered as Type No. 812. Seeds of selected types of flood resistant paddies have been distributed among cultivators for carrying on exhaustive field trials under natural flood conditions in representative flood areas. A type of salt resistant paddy giving very good performance in highly saline soils is available for distribution. Efforts are being made to cross *Oryza Coarctata* (*Nali*), a wild species of *Oryza* found in estuaries, with the salt-resistant Type No. 26B with a view to evolving a paddy which will be able to stand both the saline and flooded conditions alike.

As the result of field trials of the ten strains evolved at the Rice Research sub-station, Berhampur—the superiority of Berhampur No. I—a white grained strain of *Boroponko*, Berhampur No. III—a selection from Bayahunda, Berhampur No. VI—a selection from *Ratanchudi*, and Berhampur No IX—a strain from *Mypali*, over the corresponding local variety has been established. Experiments to evolve drought resistant type for the Ganjam District are in progress. A few crosses have been made to have a good quality paddy with purple coloured stem and leaves for eradication of wild rice.

At the Rice Research Sub-Station, Jeypore, research work with a view to selecting high yielding strains from the important varieties of Koraput district, is making satisfactory progress. Yield trials of promising types selected at the Research Stations at Berhampur and Cuttack were carried out at Jeypore. Experiments to find out the proper seed rate and suitable method of cultivation and manuring have been started.

In the physiological section experiments are in progress under the guidance of Prof. P. Parija, I.E.S. with a view to inducing flood resistance in ordinary paddy varieties with presowing treatments. Cheap methods have been evolved for breaking the dormancy of paddy seeds. It has been found that smoking of seeds for 2 to 3 hours on 2 to 3 successive days can induce germination within a few days after harvest. Dehusking the seeds has been found to be the most effective method of breaking the dormancy.

(f) UNITED PROVINCES (NAGINA).

During six years of work at this station some 55,000 lbs. of seed of improved paddy types has been distributed to Government Farms and cultivators. The main lines of research consisted of breeding work,

agronomic trials and hulling and cooking tests. The work included also the collection and study of new varieties from abroad and from different parts of India. Comparative yield trials of selected varieties have indicated high yield strains that will suit different tracts such as dry, irrigated and sub-montane. The 'Sathi' cross made to evolve fine early types with protective sheath for the year to prevent damage from the 'Gundhi fly' reached its 9th generation. Some hybrids gave better performances in yield than the 'Sathi' parent.

Manurial trials to test the effects of *Sanai*, ammonium sulphate, granular and powdered calcium cynamide compost, castor-cake and molasses were carried out. In cooking tests it was found that long duration rices were on the whole better cookers.

A survey of the main paddy growing districts of the United Provinces was conducted. As a result small quantities of seeds of new selections were sent out to some districts for preliminary yield trials.

B. WHEAT

1. *Standing Wheat Committee.*—The third meeting of this Committee was held at Simla in May 1939. A statement showing the subjects considered together with a brief summary of the recommendations made in each case will be found in Appendix XI. Action is being taken on the recommendations wherever necessary.

2. *Investigations of cereal rusts (Dr. K. C. Mehta).*—A brief statement of the important work done during 1938-39 is given below:—

(I) Seed and root wood of three of the less common species of Berberis and three species of Thalictrum from Kashmir were obtained. Inoculation experiments were to be made on these plants during the cold weather.

(II) Further evidence of oversummering of rusts in the hills was obtained. Black and brown rusts broke out at Coimbatore as early as September 7th and 8th respectively in miniature plots sown during June—July.

(III) Two hundred and fifty-four collections were analyzed. No new physiologic race was met with in the case of black and brown rust but a new race provisionally numbered as G was isolated from a collection of yellow rust of barley made in 1936-37.

(IV) Pure cultures of all the physiologic races were maintained at the Simla Laboratory throughout the year. All the three rusts of wheat were present in the miniature plots in a viable condition.

(V) Study of wind curves again showed that winds from stations of earlier rust appearance passed over several places at least a fortnight before any infection was found on the local crops.

(VI) A large number of tests were carried out in connection with the breeding of resistant varieties of wheat.

(VII) Survey of rusts was also made in co-operation with the Professor of Botany, Lyallpur, Plant Pathologist, Poona and the Government Mycologist at Nagpur and Coimbatore.

The proposal for the extension of this scheme for a further period of three years from the 1st April 1940 was recommended by the Advisory Board at its meeting held in November 1939. Pending consideration of the proposal by the Governing Body at its next meeting, the scheme has been sanctioned up to the 30th September 1940.

The question of the control of epidemics of wheat, as advocated by Rai Bahadur Dr. K. C. Mehta, was considered by the Wheat Committee and the Advisory Board in May 1939. The Committee recommended that (a) the Government of Madras might be requested to put up a scheme for the suspension of the April-June wheat crop in the Nilgiris and the Palni Hills experimentally, to see the results of the methods advocated in a limited area and that (b) an experiment should be carried out in the Kulu Valley (Punjab) which is a fairly secluded region, in order to test the effect of 'clean up' of all out of season wheat plants which were potential means of carrying the rust disease. The Board accepted these recommendations. These schemes, when received, will be considered by the Advisory Board in due course.

3. *Breeding of rust resistant wheats.*—The object of this scheme is to evolve wheat varieties (suitable for the hills) combining rust resistance with other economic qualities. A summary of the work done during 1938-39 is given below:—

Seventy-six varieties of hill wheats collected so far were under study. None of the hill wheats studied was found suitable for breeding. It was intended to try the most promising ones amongst these against some of the best varieties from the plains and exotics. The nine rust crosses selected previously for intensive study regarding rust resistance were in the F_4 generation. Out of a total of 2,640 plants tested, 1,702 proved to be resistant. Plants were selected for F_5 on the basis of rust resistance and other desirable characters. F_1 populations of seven crosses made in the previous years were studied for reaction to Black Rust. Susceptibility was found to be dominant in all cases. Sixteen typically resistant and susceptible varieties belonging to various species were selected for intensive anatomical and morphological study and preliminary work was begun.

4. *Testing the reactions of Wheat to black stem rust in peninsular India.*—In 1936 the Wheat Committee recommended that a sub-station should be located at some suitable site in peninsular India for testing reactions of wheat to black stem rust in the black soil areas of India. The Imperial Council of Agricultural Research has accordingly sanctioned a scheme of research on the subject in Bombay.

The Scheme has been financed in the first instance for a period of three years and the testing work is expected to be started sometime after the monsoon of 1940. It will be carried out under the supervision of the Plant Pathologist to the Government of Bombay. The work of testing seedling reactions will be done at Mahabaleshwar from October to June every year and during the monsoon at Poona. The production of artificial rust epidemics to test adult plant reactions of wheat will be carried out at Mahabaleshwar or at Nipad where the wheat breeding

station is located, depending on convenience and economy. The scheme also includes within its scope the black soil areas of the Central Provinces and Berar which closely resemble those in the Bombay Presidency.

5. *Wheat Milling and Baking Laboratory at Lyallpur.*—A reference was made in the annual report for 1936-37 to the provision of funds for an experimental plant at Lyallpur for carrying out milling and baking tests on wheat and for testing the quality of wheats produced in India. The erection of the plant and the equipments was completed only during 1939-40.

After preliminary tests to ensure that the equipment was working efficiently, the work during the remaining months of the year consisted of standardisation of milling and baking technique and of the methods of preparing yeast in order to ensure that a standard yeast was used for baking tests. In addition to this standardisation work, milling and baking tests were carried out on some Punjab wheats to secure corroborative data on results obtained therefrom, in the determination of quantity and quality of gluten, diastatic activity, wheat-meal fermentation time, etc.

No milling and baking tests on wheat samples from other provinces could be undertaken during the year, as the essential preliminary standardisation of materials and processes had not been completed.

C. FRUIT

1. All the reports for 1938-39 on fruit schemes were not received during the year under report, in time for consideration by the Advisory Board. A sub-committee of the Advisory Board as usual examined the reports, programmes etc. at the time of the meetings held in May and December 1939. The Board referred to the delay in submission of the reports and desired that the Provincial Governments and constituent Indian States of the Council should be requested to expedite their submission and arrange for their printing where necessary. It was also agreed that the prompt submission of progress reports should constitute one of the conditions of future grants by the Council. The renewals of certain current schemes as well as new schemes were recommended.

The Council has also laid down (i) a working principle to be adopted in allotting funds to extension of fruit research schemes and (ii) a procedure to be adopted in the utilisation of practical results derived from research schemes.

A short synopsis of suggestions regarding manurial experiments on citrus trees was prepared by the Agricultural Commissioner with the Government of India and the Statistician, Imperial Council of Agricultural Research and circulated to the Provinces and States for guidance. The help rendered in this connection by the Imperial Chemical Industries, the Overseas Potash Export Company, the Imperial Bureau of Horticulture and Plantation Crops, England, and the Director, Scientific Department, Indian Tea Association is acknowledged.

In the field of propagation of the mango, the Nakamura method of side-grafting in mangoes with pre-cured scions was started at the research stations at Kodur, Sabour and Poona, at the suggestion of the Agricultural Commissioner with the Government of India. The method is expected to be of great value and the results will be reviewed in subsequent annual reports.

Papaya seeds representing six different selections was kindly presented by Dr. Hofmeyr of South Africa and was distributed between Sabour and Kodur for trials. Valuable information on papaya genetics was also obtained from workers throughout the world. In this connection the help of the following bodies and officers in particular is acknowledged:—

1. Imperial Bureau of Horticulture and Plantation Crops, England.
2. Imperial Bureau of Plant Breeding and Genetics, England.
3. Sub-tropical Horticultural Research Station, Nelspruit, South Africa.
4. Bureau of Tropical Agricultural, South Johnstone, Australia.
5. Dr. W. B. Storey of Plant Breeding Department, Cornell University, Ithaca, U. S. A.

2. *Fruit Cultivation.*—A brief account of the progress of work done during 1938-39 under the various fruit research schemes financed by the Council is given below.

Assam (Tamulikuchi)

The scheme was started in September 1938. During the year the land was reclaimed and divided into blocks for laying down experiments.

One hundred and twenty-one samples of citurs fruits were collected out of which 65 were from the Khasi and Jaintia Hills and the rest from the plains districts of the Province. The fruits have been botanically described and the seeds extracted therefrom put in the seed bed. Growth record of seedlings is being kept. Flowers and leaves of 30 varieties of citrus were collected and preserved in herbarium sheets for identification. Four varieties of indigenous stocks selected for the stock trial experiment were collected. They are now in the nursery. Layout was made for accommodating the co-operative stock trial experiment as suggested by the Council. Seedling in the nursery were attacked by lemon caterpillars and leaf miners during March 1939. The former was easily dealt with by regular hand picking, but for the latter the common practice of squashing the caterpillars in the mines by pressing the leaves was not found to be very effective. Repeated application of tobacco decoction proved useful.

Bengal (Krishnagar)

Research was carried on Mango, Litchee, Guava, Papaya, Pineapple, Citrus Spp., Bananas and Tomatoes. The work was divided in the following four main groups:—(*a*) varietal studies, (*b*) manurial liming and cultural experiments, (*c*) clonal studies and (*d*) propagation trials.

In varietal studies of litchees a number of gooties were prepared on thirteen selected types. Thirteen varieties of papaya were put under a varietal trial of which the South Africa showed the best result followed by the acclimatised types, the Ceylon Round and the Washington. In varietal trial in Tomatoes the Bonny Best proved to be best variety and the acclimatised seeds showed better results than the imported ones.

In liming experiment in orange, liming at 10 mds. per acre-inch of soil in a 3×3×3 feet pit gave the best results. Malta orange from Agra and seedless *Kagazi* appeared promising. Manurial and cultural experiments

have been started with successful varieties of bananas. Side suckers of pine-apple proved to be the best propagating material. Observations were also made on common diseases such as Citrus Canker, Citrus Gummosis, Citrus Chlorosis, Mango Anthracnose, Tomato Chlorosis, White Ants and Sun-burn of Papaya fruits; and different control measures were studied.

Bihar (Sabour)

The research work is concentrated on (1) the periodicity of bearing in mango (2) vegetative propagation of mango stocks, (3) propagation in the case of *litchi* and (4) the problems of variety and sex in papaya.

Mango.—With a view to break the 'alternate' rhythm or 'periodicity' in bearing, factors such as tree morphology, growth habit, cultural manipulations etc., governing this habit are under study. This will elucidate the factors determining fruit-bud formation in the mango as far as they influence the habit of alternate bearing. Observations regarding tree morphology made to date show that interesting differences exist in the different varieties. The typically alternate bearing varieties flower only once a year and in their case the majority of panicles are pure. Other factors under investigation are (i) seasonal metabolic changes and their relation to growth and fruit-bud differentiation and (ii) effect of deblossoming in an 'on' year on flowering in the following year. Mango budding has yielded about 30 per cent. success as elsewhere in India.

Litchi.—Preliminary results indicate the effectiveness of Indole Butyric and Indole Acetic Acids on rooting of mango and *litchi* cuttings. The sixty days allowed for rooting was, however, found too short for actual root growth. Of the two acids indole butyric acid showed the greater effect.

Papaya.—Work on continuous inbreeding with Washington and Ceylon long papayas has been taken up with a view to obtain pure lines. Preliminary observations have been recorded. Seeds of different samples were collected and grown at the station. In all cases a single lot of seeds obtained under one name had produced more than one kind of plants. Seeds obtained from individual fruits have also given papayas showing variation. A planting experiment has shown that the number of male-trees in a garden may be effectively reduced by planting 2-3 seedlings in one position and finally thinning them to one when they flower. Removal of stigmas before opening of flowers has shown that fruits can develop parthenogenetically.

Central Provinces and Berar (Nagpur)

This scheme has completed nearly two years out of five years for which it has been financed by the Imperial Council of Agricultural Research. The requirements of the Improvement Trust have necessitated the relinquishing of the site originally selected for field experiments, and proposals for another site have been submitted to Government.

Lack of harmony within the section has had a serious effect on the progress of the scheme, and there is little to report except that the work continued generally along the former lines to the limited extent which the peculiar conditions prevailing in the section permitted. The work of this section was inspected in detail during the year by the Agricultural Commissioner with the Government of India.

Madras (Kodur)

Trials at the station for improving the technique of bud-insertion for ascertaining the best time of lopping the stocks after budding, and the best season for budding have yielded useful results. The station supplied reliable plants of known parentage propagated from trees of proved merit. Root stock trials were conducted with several varieties of citrus and mango. The vast foraging power of certain rootstocks at a very early stage of their life as well as the value of determining the optimum orchard spacing on the basis of varietal root habit have been clearly brought out from a study of the root systems of eight root stock varieties of citrus. Rootgrafting has again proved to be a feasible method in mango propagation. Contrary to the popular belief it has been found possible to lift seedlings successfully with naked roots. On the basis of three years' data relating to the individual shoot growth and performance of three different varieties it has been found that a prolonged resting period during the preceding season is conducive to flower bud formation. Definite progress has been made in working out a system of nomenclature and classification of South Indian mangoes. Detailed morphological descriptions of several varieties have been recorded. Different varieties of fruit stocks were obtained from various parts of India and planted in the miscellaneous variety collection plots. Some preliminary observations on the methods of collecting crude papain have been recorded

Mysore (Hessarghatta)

Although preliminary work at the Fruit Research station commenced from February 1938, the actual date of starting the scheme was from 1st July 1938. Nine varieties of stocks of Apple imported from East Malling were tested and varietal trials on both desert and culinary apples, guava, peach, litchi, avocado, strawberry and sapodilla were carried and growth measurements recorded. Combined manurial and irrigation experiments were also carried with apples and pine-apples. Pests and diseases of the fruits have been observed and are being properly controlled.

North West Frontier Province (Tarnab Farm).

The object of the scheme is the improvement of fruit culture in the province and the problem of marketing. Work is concentrated mainly on peaches, plums and pears, the chief fruits of the province. A brief account of the delay in initiating the work was given in the previous annual report. The technical programme of work for the scheme was approved by the Advisory Board, at its meeting held in May 1939. Mr. M. I. Shah who has been sent to East Malling Fruit Research Station for training is expected back in India in September 1940 after training.

Punjab (Montgomery)

Citrus Stocks and grape vines.—The Orchard at Montgomery can give no final data as yet, although in the meantime valuable comparisons are being made on many matters, such as the rate of growth, vigour, etc., of the trees growing on the various rootstocks. There are strong indications based on a detailed study of the leaves that out of several dozen differently named varieties collected from places all over India and Ceylon, there may not be more than a dozen and a half that may be distinctly different from one another. The comparison of 'head volume' of different

varieties reveals strikingly the possibilities of growing large sized trees comparatively much earlier by the rooting of stem cuttings than by seed. The trees grown from cutting also appear more precocious and prolific than their contemporaries raised from seed. The study of 2 to 2½ year old stem-budded citurs plants gorwing on certain rootstocks propagated both from seed and by cuttings and the study of the coefficients of variability for the height of the root-stocks seedlings at transplanting time and of the growth of all trees under various scion-stock combinations has been continued. A new set of 24 root-stocks is being raised for investigations

In regard to grape hybridization, 462 F_1 seedlings were planted out in the field in the spring of 1939 and 2,175 seeds representing 29 new crosses made in April 1938 were sown for raising seedlings.

Investigations on citrus diseases such as wilt of citrus seedlings, Anthracnose (wither-tip) of citrus trees, citrus canker and their control measures have been taken up. Arrangements have been made for studying relative resistance of different stocks to important citrus diseases. Observations have been recorded to study the incidence of anthracnose disease on 126 varieties of grapes grown at Lyallpur.

United Provinces (Chaubattia)

Horticultural.—A thinning experiment on apples revealed that both the size and colour of the fruit could be improved by thinning without reducing the yield per tree. Ringing of unbearing trees in April was shown to induce flowering. Budding of superior apples on Crab C stock in September and grafting in March with grafting wax was found to be better than budding in May and grafting in March with clay. The propagation of different stocks by cuttings with the use of root forming harmones and various treatments for rejuvenation of old apple trees gave useful results. Old peach trees when headed back and manured with complete fertiliser gave satisfactory results. A one per cent spray of sodium chlorate three times during the year on Oxalis bulbs and a 2½ per cent. spray of the same chemical once a year on Siroo grass, resulted in controlling these two serious weeds effectively. The problems of manure for orchards are also receiving attention and experiments are being conducted on different treatments of pine needles with the object of making compost.

On the *entomological* side investigations are in progress on the apple root borer, woolly aphis, scale insects and defoliating beetles. The interaction between apple stock and scion in regard to the woolly aphis pest and the effect of different types of soils and root colonies is under investigation. The resistance of important varieties of peach to scale insects and Russian apple seedlings to woolly aphis is being tested. Further observations on the life histories, distribution, economic significance and control measures for other pests are continued.

Chemical problems include a study of the soil in relation to the cropping capacity, varietal performance, incidence of diseases and pests, both along and across the slopes at regular distances of 100 ft. So far 67 groups of soils have been obtained and some 60 soil analyses both chemical and mechanical have been completed. The soils have been found generally to be acidic in character and of low phosphate content. A closer study of the soil at 50 ft. distances has been commenced.

In the section of *Mycology* a survey of the major diseases of fruit trees was continued. In all 4,253 apples, 323 pears, 570 peaches, 156 apricots, 276 cherries and 203 plums were examined. The percentage of intensity of diseases was recorded for further study. In addition, observations were made and recorded on important diseases including collar rot, stem brown, pink disease of apples and storage diseases.

3. *Canning, Storage & Preservation.*—The following is an account of the work done under Canning, Storage and Preservation schemes:—

(i) *Fruit Canning and Preserving Research Scheme, Quetta* —Although the scheme to establish a Canning and Fruit Preservation Laboratory at Qeutta was sanctioned early in 1934 by the Council, it came into working only in April 1938 when the Research Assistant was appointed. Due to want of facilities for work only a few small scale experiments on canning and the preparation of fruit juices, etc., could be carried out.

A few varieties of peaches, local as well as imported, and plums which were canned successfully are under observation and the results obtained are very encouraging. A series of preliminary experiments were conducted to standardise a method for the preparation of a suitable beverage, juice or syrup from pomegranates and grapes. An attempt was also made to prepare a suitable dried product from the Kishmish and the Haitha grapes.

The Advisory Board examined the technical programme of work and recommended that it should be revised in consultation with the Agricultural Commissioner with the Government of India.

(ii) *Cold Storage Research Scheme, Bombay.*—The year under report represents the fifth year of the scheme at Ganeshkhind. During that period cold storage trials of *mosambis* and *Santras* from Aurangabad, apples from Chaubattia, peaches from Peshawar and pears from Kashmir were carried out and the experimental results furnished to the officers who supplied the material for trial. In addition observations were made upon the respiration of the Alphonso and 'browning of the skin of the ripe fruit. Among vegetables utilised for cold storage experiments, cabbages, onions, shelled peas and beets roots were included. Practically all the important fruits and vegetables produced in India have now been experimented with at the station and their suitable cold storage temperatures ascertained and recorded.

The respiration studies of Alphonso mango showed that the rate of respiration was at its maximum when the fruits showed the first signs of change in colour and decreased as the ripening progressed. The rate of respiration remained steady during storage at 40°F. Chilling or browning of skin of ripe Alphonso fruit at 52°F did not effect the rate of respiration. It was found that the storage of ripe fruit at 52°F under partial vacuum prevented chilling.

Cold storage trials of santras and mosambis received from Aurangabad showed that the mosambi developed a very nice orange colour at 52°F. The santras could be kept in good condition for three months and a half and the mosambis for four months at 40°F.

Soni bananas were chilled at 52°F but ripened satisfactorily at 56°F after four weeks of storage. Apples of delicious variety from Chaubattia (United Provinces) kept well for a year. Peaches from Peshawar remained in good condition for six weeks at 32°F and 35°F and pears from Kashmir for twelve weeks at 32°F.

It was found that onions stored well at high temperatures of 75° to 95°F. though the loss in weight was big. The onions stored for nine at 90° to 95° F did not lose pungency. Cabbages wrapped in wax paper remained in a better condition than those kept without wrapping. Shelled peas could be kept in good condition for three weeks at 32° and 35° F when packed in glass bottles. It was found that beet roots which ordinarily shrivelled could be kept in good condition for about five months at 32° and 35° F when stored in a tin or wrapped in wax paper.

(iii) *Cold Storage of Fruit, Punjab.*—The experiments during the year dealt with maltas. santras, grape-fruit, mangoes, pears and grapes. Data of value to the commercial community are being collected in the case of each fruit on such matters as the most suitable degree of ripeness at which to put the fruit in cold storage; the correct temperatures at which to store; the period over which the fruit can be stored most profitably; the wastage during storage and the length of time the fruit will remain saleable under ordinary temperatures after being removed from storage

These investigations are being financed jointly by the Government of the Punjab and the Imperial Council of Agricultural Research. The cold storage plant was provided originally by the Cold Storage Company of Northern India, but that company having gone into liquidation, the plant has been purchased this year by the Government of the Punjab.

(iv) *Punjab Fruit Preservation: Lyallpur Scheme.*—The investigations in progress relate to a variety of problems which include the improvement of the flavour of orange squash; the blending of citurs juices in the preparation of squashes is the successful preparation of Lemon Barley Water using Punjab barleys instead of the imported 'Pearl' and other similar barleys; the 'packing' of natural unsweetened citurs juices by deodoration which appears to retain the taste and flavour of the juice better than when it is treated in the ordinary manner; maturity tests on the best degree of ripeness of pears for canning purpose, canning tests with mangoes; determination of losses in vitamin content during the manufacture of tomato juice when stored in containers of different kinds. These all are matters of considerable economic importance in the development of a profitable fruit preservation industry.

D. FIBRES.

Sann-hemp research scheme, Bombay.—The scheme was initiated on the 1st April, 1938. Experiments were started in three centres. The early sown crops were comparatively more vigorous than those sown late, but a dark tinge developed on the stems, persisted all along till harvest and finally gave a dark colour to the fibre, thus lowering its cost. The fields became full of weeds and were also affected by wilt. The early sown fields, particularly at Baparda, had too much rain and this had an adverse effect on the crop. Again the crop also became overripe before conditions were favourable for harvest and this resulted in producing weak and short fibre.

The late crop was sown by the end of August. It showed signs of wilting, the disease being identified as *Anthracnose.*

Crop sown for seed suffered a severe attack of stem-borers. Lead arsenate spray was tried with very good results.

As however, adequate supervision facilities were not available and as the results obtained during the first year were not sufficiently encouraging, the Director of Agriculture, recommended to the Government of Bombay that the scheme should be closed down at the end of the year and it has accordingly been closed down with effect from the 1st January 1940.

Sann-hemp research scheme, Bihar.—The scheme started in January 1937 and is one of the four schemes of research at Bombay, Bihar, Madras and Central Provinces with the same general programme of work.

It provides for a general survey of the varieties in Bihar with a view to the selection of promising types, extraction of fibre by wet and dry processes—*i.e.*, (1) retting the sop immediately after harvest without drying (2) retting after drying the sop for sometime after harvest, —under different conditions of seed-rate, growth and retting. During the year under report a survey of two districts of Bihar was completed. It was found that the crop was mainly grown by cultivators for their home consumption. Both wet and dry methods were employed for retting. Sixty seven line cultures were studied during the year and desirable types were isolated for further studies. Studies were continued to evolve desirable late strains combining high yield of the *Deshi* variety, and the quality of the *Patwaria* variety.

Central Provinces and Berar Sann-hemp scheme.—The year under report is the third year of the scheme. Mass selection and single plant selection were continued to isolate suitable strains. Varietal experiments with four varieties, *viz.*, Jubbulpore. Chhindwara. Pusa and Cawnpore No. 12 were carried out. and the three other varieties were found definitely superior to the Pusa variety in yield. The study of the biology of the flower was continued, and observations relating to the time of opening of the flowers were made. In pollination studies setting was observed when the flowers were enclosed in paraffin paper bags. Better results were obtained by artificial pollination, or by applying a drop of glucose solution to the stigma. Bagging the flowers and introducing bees, or tripping the fully opened flowers inside the bag did not give successful results.

Experiments on the effect of seed rate, times of sowing and harvesting on the yield showed that the optimum seed rate was 60-100 lbs. per acre. It has been observed that the earliest sown crop gives the maximum yield, and that harvesting at the 'dead ripe' stage gives the highest yields of dry stalk. The latest sown crop gave very poor yield irrespective of the time of harvest and variations of seed rate in respect of the early-sown crop had no effect on yield. Interactions between dates of sowing and stages of harvest and seed-rates were not significant; nor were interactions amongst the different treatments very significant.

Retting the fibre in running water gave cleaner fibre than retting it in standing water. In winter retting carried for about a week while in March and April for four to five days. Prolongation of the period by one or two days affected the yield and strength of the fibre adversely.

Flax fibre scheme, Bengal.—The year under report is the fourth year of the scheme. During this year the area under cultivator's holdings was considerably increased. Experiments were also conducted on different type of lands (*i.e.*, inundated and uninundated by floods) the selection of the piece of land being made in such a way that the superiority or otherwise of flax as a winter crop could be judged.

Trials with 'Liral Monarch' and 'J. W. S.' were continued, and it was found that the former had a tendency to lodge when cultivated on clayey soil, more particularly when the soil was wet and there were high winds. It therefore seems to suit better lighter areas. Trials were also carried out with Cawnpore varieties.

Breaking and scutching machines were supplied to private persons, and extraction was done under the supervision of an expert labourer. The breaking rollers were found to work slowly and it added to increase in cost. It is proposed to instal a power breaker and to conduct a comparative trial of machine extraction *versus* hand extraction during the coming year. As recommended by the Botany and Physiology Committee in November 1938 arrangements are being made to establish a central rettery.

During the year retting was done at different places, and from the analysis of water at these places and the fibre produced, it would appear that the presence of organic matter in water has a tendency to produce better fibre. Attempts were also made to extract fibre from flax straw with soap solution. The resulting fibre was found to be too fluffy, sticky, and weak.

Experiments on the storing of the straw were also undertaken. It was stored like paddy straw and was found to keep well for one year.

E. TOBACCO.

Tobacco Sub-station, Guntur.

The following is a brief statement of the work done at the sub-station in 1938-39:—

The study of the effect of various types and combinations of manures on the quality of cigarette tobacco leaf showed that nitrogen has an accelerating effect on yield, height of plants and other plant characters but tends to delay maturity and, at higher rates, reduces quality.

20 lbs. of *N* with a basal dressing of 2 tons of farm yard manure per acre has given good results for quality. But taking all characters into consideration, N+K+P with the basal dressing appears to be the most generally suitable combination.

Farm yard manure and the basal dressings, owing probably to the unfavourable seasonal conditions, did not give as good results as in the last year. There are also indications that the manurial treatment for the seed bed may affect the quality of cured leaf.

The possibility of growing tobacco in the *rabi* after the *kharif* crops was studied but the results showed that the subsequent tobacco is poor.

From the results of the varietal trial, on improved varieties of cigarette tobacco suitable for Indian conditions, Bonanza, a new introduction from America, seems to be a promising variety. The seed acclimatisation experiment showed that while acclimatisation improves yield its effect on quality is uncertain.

Studies of the leaf curl disease of tobacco were continued and further progress made, especially as regards the alternate hosts of the vector.

The Tobacco Sub-Committee and the Advisory Board examined the report and made several suggestions particularly regarding the need for systematic manurial experiments, rotations, varietal tests and flue curing work. It was also recommended that as there was no leaf curl disease in Guntur, work on this aspect should be carried out as part of the ordinary

work of the Mycologists and Entomologists of the Imperial Agricultural Research Institute, but that mosaic disease, powdery mildew and orobanche will have to be investigated in due course. It was decided that the programme of work under the scheme should be revised accordingly.

Tobacco flue curing experiments.—Reports on the flue curing experiments carried out on the crops grown during 1937-38 were considered by the Tobacco Sub-Committee and the Advisory Board in May 1939. It was felt that specially good results had been obtained from the Warangal-Bilaspur centres. As however there were too many disturbing and varying factors, it was considered that comparison of the samples could not be made and on a recommendation made by the Committee and the Board, it was accordingly decided to close down these experiments forthwith, any future work on standardisation and improvement of curing methods being left to be undertaken on the advice of the special tobacco officer appointed by the Council. The barns which the Council had provided at various centres would however be available to the Governments concerned for carrying out their own experiments.

Tobacco Sub-Committee.—A meeting of a Tobacco Sub-Committee consisting of officials and non-official representatives of all the interests concerned with tobacco cultivation, manufacture and trade, was held in conjunction with the meetings of the Advisory Board in May 1939. Apart from the progress reports on the working of the Tobacco Sub-Station at Guntur and the co-operative flue-curing experiments on tobacco financed by the Council, the Sub-Committee considered the report on the tobacco marketing survey in India and Burma submitted by the Agricultural Marketing Adviser to the Government of India, and certain other subjects pertaining to the crop. A statement (Appendix XII) is attached showing the recommendations made by the sub-committee on the several points arising from the tobacco marketing survey report. Action is being taken by the proper authorities on those recommendations. The sub-committee also considered the question of improvement of the quality of the tobacco crop by crop rotation and was of the opinion that so far as cigarette tobacco was concerned there was need for some sort of rotation and that the crop should not be sown in the same plot in two successive years but that in regard to *hookah* and other types no particular necessity for rotations was indicated although the matter required further investigation.

Training of Tobacco Officers.—A reference was made in the previous year's report to the Council's decision to send Indian workers on tobacco for training abroad, particularly in America, one each from the Centre and the provinces of Bombay and Bihar. The Central Officer, Mr. C. V. S. Chetty, who was previously the Superintendent of the Tobacco Sub-Station at Guntur, returned to India in December 1939 after successfully completing a course of training in the United States of America, Canada, Japan, Singapore and Ceylon. He has submitted his report which is under consideration at present and is expected to be published shortly. He has also toured in certain parts of the country to advise growers, curers, packers, etc., in regard to improvements in their present methods.

The two other officers, one each for Bombay and Bihar, whom the Council has decided to send abroad for similar training, have been appointed by the respective Governments. They are expected to proceed to America in time for commencing their training at the beginning of the next tobacco growing season early in 1941 and in the meanwhile have

completed a short tour of certain tobacco growing provinces in India in company with Mr. Chetty.

These officers are particularly required to study the following aspects of tobacco cultivation in America—

(1) *Seed.*—Proper methods of selection and multiplication so as to prevent deterioration;

(2) *Cultivation.*—Suitable methods of topping, suckering, interculture, etc. to improve the body and substance of the leaf;

(3) *Curing.*—Methods of curing designed to shorten the period and to improve the colour and texture of the product.

(4) *Grading.*—Systematic grading by growers and curers and methods of sale on the basis of grades through auction floors, etc.

(5) *Redrying and re-conditioning.*—Methods as applied to stripped and unstripped leaf, particularly with a view to securing uniformity in results.

(6) *Packing and storage.*—Methods designed to ensure the maintenance and improvement of quality over a prolonged period.

F. OILSEEDS.

Madras Groundnuts Scheme.—The year under report is the second year of the scheme, the aim of which is the isolation and maintenance of pure lines of groundnut with high yield, high oil content, low acidity, resistance to disease and suitability to different soil and climatic conditions.

The season as a whole was unfavourable to the crop due to the failure of the north-east monsoon and the bunch varieties were the most affected. From study of the previous year's single plant selections 45 were marked out for preliminary yield trials during the next year.

A standardised pure line trial was conducted at 27 different agricultural stations all over India. Yield analysis and qualitative determinations were made and the effect of soil and climatic variations computed.

The applications of potash and nitrogen without a basal dressing of cattle manure gave significantly increased yields. Oil analysis and qualitative determinations did not reveal any effect by the different treatments. Developmental and root studies of the bunch and spreading varieties were continued.

Madras Coconuts Scheme.—As stated in the last year's report work on the scheme was commenced in September 1938. The scheme envisages the investigation of certain practical and economic problems connected with coconuts. Its main aim is to establish a criterion for selection of seedlings that would ultimately give good yields, to study the variation in the copra and oil content of trees of distinct bearing capacities, investigations of the quality and quantity of copra, oil and fibre obtained from nuts of varying maturity.

Study of the suitability of the husks at different stages of maturity for the manufacture of coir, showed that 8 months units were too tender. Experiments on the quality and quantity of copra from nuts of the different age groups showed that 9 and 10 months old nuts yielded poor quality copra when compared with that from 11 and 12 months old nuts; the latter groups gave also higher quantity of copra. As regards oil content, the 9 and 10 months old nuts gave significantly higher yield of oil than the

older nuts. The oil content increased by storage in younger nuts while it decreased in older nuts. A marked increase in the free fatty acid content of the copra from nine and ten months old nuts when stored was also recorded.

Scheme of Research on Linseed, Bengal.—The year under report is the third year of the scheme which is mainly intended to test out the improved strains of linseed evolved at Pusa, United Provinces and Bengal with special reference to their oil content and agricultural properties. During the year 20 varieties were selected for trial and were sown in randomised blocks at different times to find out the effect of the time of sowing on iodine value and oil content of the seed. From the experiments it would appear that the oil percentage as well as the iodine value depended mainly on heredity though they also appear to be dependent to a slight extent on environmental conditions. The colour of the oil appears to depend on the nature of the soil, and earlier sowings gave higher oil percentages.

Oil-seeds Research Scheme, Punjab.—The year under report is the third year of the scheme which is mainly intended for research on the *Brassicae* oilseeds of the Punjab, notably *toria*, *sarson mustard* and *taramira*, with special reference to problems of fertility and self-pollination. Several improved strains were obtained by group breeding in the case of self-sterile species of oleferous brassicae. Methods of self-pollination with bred bees were further improved. Experiments were carried out under field conditions as well as under controlled conditions, with a high degree of success. As a result of pure line breeding including hybridisation between desirable and self-sterile species, a number of very promising types have been evolved and these will be tested out in the coming year. Experiments were carried out with five different varieties of *sarson* and *raya* against local raya at several centres in the province, and it was noted that the performance of Raya O. B. 1 was specially remarkable. It was decidedly superior to the locals in yield, purity, resistance to drought and disease. In addition it has a high value as a fodder.

Interesting results have been obtained from manurial experiments with *toria*. Application of *toria* cake and ammonium sulphate gave significantly higher yields than the control. It would however, appear that heavy doses of manure have an adverse effect on the oil-content in most cases, though it increased the yield of the seed. Investigations to determine the period of most rapid oil formation in *toria* have yielded very interesting results and a separate paper has been published on the subject.

Oilseeds Scheme, Central Provinces.—The year under report was the third year of the scheme which was started in February 1937. The work is carried on four important oilseed crops, *i.e.*, linseed, seasamum, safflower and niger.

During the year Australian and Argentina strains of linseed and Burma strains of seasame were tried and nine of these types were selected for further studies. Selections in the year were 366 in linseed, 560 in seasamum, 40 in safflower, and 15 in niger. Oil percentages of 25 linseed selections, 18 safflower and 5 niger selections were determined. Experiments on self fertilisation in the four crops were carried out, and the results showed 5 per cent. cross fertilisation in linseed, 65 per cent. in seasamum, 22·6 per cent. in safflower, and 100 per cent. in niger. The problem of sterilily in seasamum due to phyllody was studied in detail.

The crop was sown on different dates to see whether the phenomenon was related to the time of sowing and amount of rainfall. The results so far obtained did not show any correlation.

In linseed experiments were conducted to obtain fibre as a by-product from the linseed stalks which are at present thrown waste, and a dry scutching process which permits the fibre being extracted without any retting process has been developed.

Hyderabad Castor Improvement Scheme.—The report covers the fourth year of the scheme which was initiated in August 1935. The main work of the season was the intensive study of 212 plant cultures with reference to their important botanical and agricultural characters. About 100 cultures were isolated and retained for further intensive study during next year. By a process of elimination 5 practically homogeneous high yielding strains have now been isolated out of 52 cultures and are now ready for field scale trials of final yield tests.

Manurial experiments with the object of determining the effect on the yield and oil content of the seeds will be carried out during next year.

Propaganda for Cotton Seed Cake.—At a meeting of the late Indian Oil Crushing Industry Committee of the Imperial Council of Agricultural Research, held in 1933, the Committee considered the question of encouraging the cotton seed oil industry in India and recommended that the only way to avoid the economic loss resulting from the practice of feeding uncrushed cotton seed to livestock by the agriculturist was to build up a demand for cotton seed cake through the agency of provincial and state Agricultural Departments.

A scheme for undertaking cotton seed crushing and supply of decorticated cake for propaganda by the Government of the United Provinces was accordingly sanctioned by the Council. The Provincial Government have provided the plant and material and the Council has only guaranteed a sum of Rs. 10,000 spread over three years, to cover any losses resulting from the working of the plant and the supply of cake to provincial Agricultural Departments.

The scheme was started in the year 1937-38 and 370 maunds of decorticated cotton seed cake was supplied to the Agricultural Departments of various provinces and states for the educative propaganda.

The seeds from defferent provinces could not be collected in 1937-38; hence the work of examination was taken up in the year 1938-39.

During the year 1938-39 cotton seed samples collected from the various provinces and states were examined for the moisture, husk, kernel, and oil contents.

On an average all the samples of cotton seed examined gave the oil content between 11 and 19 per cent. and the husk and kernel contents from 43 to 57 and 32 to 49 per cent., respectively.

During the various trials of delinting, decortication and pressing, yields have been as under:—

	Per cent.
1. Oil	10—11·5
2. Cake	40—42
3. Husk	40—45
4. Cotton Lint	·15—·4

During the period 1938-39 the Agricultural Departments of various provinces and states were supplied with 214 maunds of decorticated cake.

G. MILLETS

Proposals for co-ordinated research on jowar.—The Agricultural Commissioner with the Government of India while reviewing the work already done on this crop considered the following items to be important for further research:—

(1) *Varieties*—

Grain and Fodder,

Kharif and rabi,

Early and late,

Drought resistant varieties,

Striga resistant varieties.

Associated with this is the question of jowar genetics in so far as characters of agricultural importance are concerned.

(2) The place of jowar in a planned agriculture both as to its economics and its value in rotations.

(3) The yields of jowar and ways of increasing them.

(4) The pests and diseases of jowar—

(*a*) the fungus diseases of jowar—

Smut, Rust, Wilt, etc.,

(*b*) the insect pests of jowar—

Borer, etc.,

(*c*) the physiological diseases of jowar—

"Chikta", etc.

(5) Jowar in human and animal nutrition.

(6) Other means of utilisation of jowar, *e.g.*, malting, etc.

This subject was considered by a special Sub-Committee in November 1939 which made the following recommendations:—

(1) *Varieties*:—It was decided that a small sub-committee should undertake the working out of a schedule for the description of jowar varieties in the same way as has been done for cotton and rice and as is being done for wheat.

The question of grain storage was considered as an essential prerequisite to any scheme of seed multiplication. It was pointed out that the grain could not be kept in storage in large quantities. The production of pure grain over a big area was also difficult on account of the amount of cross-fertilisation which takes place. These two difficulties, therefore, definitely determine the nature of seed multiplication centres which should (1) be so arranged that only moderate amounts are stored in one place, (2) the seed distribution in a solid block (such as the whole of a village) should be covered by one variety. It was suggested that the Imperial Entomologist should be invited to work out some cheap method of keeping jowar grains from being attacked by insects in store.

(2) *Striga resistance*:—Pending further work by Professor Kumar in the Striga research (which is financed by the Imperial Council of Agricultural Research) the Committee felt that further work on the production of Striga resistant variety in the provinces would have to wait for a further development of Professor Kumar's work.

As regards field measures against Striga, none of these appear to have been successful and the real remedy lies in the production of resistant varieties.

Drought resistance:—Selection for a physiological quality of drought resistance as such was regarded as not feasible but the Committee pointed out that the following characters were directly connected with drought resistance and should be given due weight in making selections for areas of precarious rainfall:—

(1) dwarfness,
(2) earliness,
(3) vigorous early development of roots and
(4) deep rooting.

(4) *Diseases*:—All Provinces in which Jowar is important have for years carried out intensive propaganda in the use of sulphur or copper sulphate against smut. Most of the other fungus diseases are not important except helminthsporium. In the United Provinces which is some times attacked by this epidemic further work is required.

Insects Pests:—The life history of the jowar borer is well known and the methods required for defeating it. It was agreed that what is particularly required there are measures to prevent infection of one crop by another, such as chaffing of the fodder before April. The Committee also agreed that more work appeared to be required on the sticking insect (Calacaros).

The "Chitka" disease.—This appears to be important only in certain parts of the Bombay-Deccan and is due to a combination of low moisture and low humidity. It is therefore not a disease which can be controlled.

The yield of Jowar and ways of increasing it.—It was pointed out that, while it is not difficult to increase the yields of Jowar, it is generally not economic to do so. In rotations in which jowar occurs, it is generally the alternate crops which are manured *e.g.*, cotton or sugarcane. Special emphasis was laid on the necessity for getting some leguminous crops which could be grown along with or in rotation with *rabi* jowar.

The place of jowar in a planned agriculture both as to its economic and its value in rotations.—It was recognised that on account of its necessity as a food to man and beast, the jower crop would remain in rotations but it was also pointed out in certain places that there has been a real danger of the jowar crop being reduced to make way for cash crops which might temporarily be paying. It was emphasised that a balance had to be struck between the various crops and that food and fodder crops should not suffer.

5. *Jowar in human and animal nutrition.*—Reference was made to Dr. Aykroyd's recent pronouncement regarding the nutritive value of Jowar as compared with rice and the undoubted place that it occupied in animal feeding.

6. *Other means of utilisation of jowar e.g. malting etc.*—The Committee was informed that a semi-commercial plant which had already proved the method of malting jowar on a large scale was about to start work in Madras.

Additional subjects.—More work appeared to be required on the making of jowar silage and mixed silage. Reference was also made to the

expense of watching the crops against birds and the possibility of producing a variety which had longer glumes and awns as a protection but it was pointed out that this meant very much greater difficulty in threshing.

These recommendations were accepted by the Advisory Board and necessary action has been taken thereon by the Council's Secretariat.

Investigation into the attack on Jowar by the parasite Striga.—Work on the scheme has been in progress since May 1938. The work of selecting Striga-resistant plants in "Bilichigan" and "Muddinaudyal" varieties was continued. Work was also started with the same aim on four varieties from Central Provinces, four from Madras and two from Sind. The susceptibility of African resistant strains to Indian Striga is confirmed. The effect of light on germination has revealed striking differences between the species of striga. S. lutea germinates more in dark than in light. S. densiflora germinates in dark only and S euphrasioides in light only.

H. OTHER CEREALS—BARLEY

Scheme for investigations into the malting and brewing qualities of barleys from the United Provinces.—Thirty three samples of the 1937-38 crop were sent for analysis to the Institute of Brewing, London. The object of the tests this year was to ascertain (i) relative malting value of C 251 over local unimproved types, (ii) the difference, if any in the malting quality of C 251 grown under farm conditions and cultivators field conditions, (iii) to obtain indications of the localities most suitable for the development of C 251.

It was found that there were extraordinary differences in the appearance of the same type of barley grown at different farms. The appearance of the malts in all cases was better than would be expected from the appearance of the barleys. It was noted that most of the selected types resembled Californian Mariout or Egyptian barleys. The high opinion previously formed of C 251 was well maintained. Compared with Californian barleys of the same nitrogen content and thousand corn weight it gave about 2 lb. per quarter greater extract. It malted readily even at the highest nitrogen content. As reported last year, the main difficulty with the samples was that they were not clean. There would be no difficulty about their finding a ready market if only they were well screened before despatch.

The scheme has been extended for a further period of 2 years *i.e.*, up to 1942. During this period the preliminary malting tests will be carried out in India and only very promising varieties will be sent to the United Kingdom for tests.

The corresponding schemes in the Punjab and Bihar have been terminated.

I. POTATOES

Potato Breeding scheme for Northern India.—Fifty-one cultures selected as being probably distinct varieties from the collection of 294 samples of European and *desi* varieties of S. tuberosum were studied in detail and some more duplicates were eliminated. Some of the imported interspecific hybrids have shown very good yield, a high degree of resistance to frost, and have been used for crossing.

Hybridisation work was continued to evolve types to resist late blight and fix characters of economic value. Two-thousand four hundred forty-five seedlings derived from nine intervarietal Tuberosum crosses were raised to maturity and out of these 142 seedlings were selected for further yield and disease resistance tests.

Field notes on virus diseases were recorded. Virus disease-free material of thirteen commercial varieties of S. tuberosum was received from Cambridge and grown in the insect proof cage.

The study of dormancy and storage was continued at Delhi. In the storage study endeavour is being made to find varietal differences in keeping quality.

Proposals for the continuance of the scheme beyond the 1st April 1940, when the existing sanction is due to expire, are under the consideration of the Imperial Council of Agricultural Research.

Collection of South American varieties of potatoes.—An exploratory Empire Expedition to Andes (South America) and Mexico was organised by the Imperial Agricultural Bureau, largely on the initiative of India, for the purpose of collecting new species of Solanum from those regions, the intention being to carry out breeding work into those species in order to evolve varieties with greater resistance to diseases and other desirable characteristics best suited for local climatic conditions. The expedition was jointly financed by all the Empire countries including India. Owing to various difficulties the expedition could not start till late in 1938. A large amount of material has been collected and sent down to Cambridge where they have been carefully received and examined under controlled conditions. Samples have been multiplied after identification and distributed to the participating countries including India. In this country special arrangements have been made at the Potato breeding sub-station in Simla for receiving the material and carrying out further experimental work. Three consignments of material have been received up to the end of June, 1939.

A brief reference to the work done with the varieties received is contained in the section dealing with the potato breeding scheme for Northern India.

CHAPTER II.

DRY FARMING RESEARCH.

The schemes in all the five centres have been extended for a further period extending to the 30th September 1942. The Advisory Board indicated the future lines of work under the schemes and drew up a common programme of work for all the stations. Such of previous research items which had given conclusive results either positive or negative, have been discontinued and those which were not likely to give conclusive data were omitted. It was decided that the main lines of work during the period of extension should be agronomic which should enable the workers to evolve a system of farming capable of securing a crop even in a year of drought. The work is to be based on results of intensive scientific experiments conducted in the laboratory and field scale trials to test its practical and economic value. The salient features of the work done during 1938-39 under each of the schemes, are given below:—

(*a*) *Madras (Hagari).*—Field studies in soil moisture were continued in plots which differed in respect of the preparatory cultivation such as

'bunding', "bunding combined with deep ploughing once in two years" and "bunding combined with deep ploughing once in four years", and the local method of cultivation. These have shown advantage of the treatments in points of moisture conservation over the control. It was noticed that losses of soil moisture due to evaporation were practically confined to the top one foot of the soil. In studies on surface run-off scoops formed in run-off plots effectively decreased the amount of water and the soil lost by surface run-off. Root studies in setaria and sorghum were continued. It has been observed that farmyard manure and compost promote the growth of setaria and the effect of manure was felt at all stages in the life of the plant. The manured plants were earlier and water was transpired by them at every stage of growth, on account of increased growth. Results of trials on crop mixture showed that mixtures of horse gram and setaria and groundnut and setaria were ecologically well suited because of the roots of these legumes which feed in the top soil while those of setaria went deeper. Setaria cotton mixtures did not fare well because they fed in the same zone and this led to a severe competition between roots of these two crops throughout their growth. In their effect on conserving the soil, mixtures of groundnut (spreading) and setaria gave the best protection. It has been found that the failure of crops in these areas is due to the formation of a very hard layer of soil which cuts off the available moisture in the deeper layers. The inception of hard layer depends upon the amount and distribution of rainfall in any season. To overcome this difficulty it has been suggested that the varieties grown should be such as would form an elaborate root system sufficiently early and penetrate into the deeper moist layers before formation of the hard layer in the upper surfaces of the soil. Developmental studies have shown that the maximum height in setaria and sorghum is obtained at the time of flowering of these crops, maximum weight of dry matter is produced between the second and fourth week after flowering and the number of green leaves is largest at the time of internodal elongation. Fallowing showed significantly higher yields than 'continuous cropping' in both cotton and sorghum. In manurial experiments the manured plots showed significantly superior results to those of the 'control', both in grain and straw in setaria while no significant difference was found in grain yields in sorghum but straw yields were better in compost plots only.

(*b*) *Bombay (Sholapur and Bijapur)*.—Soil moisture determinations were carried out by the improved technique at both the stations and it was found that the moistures were in excess at Sholapur at the sowing time and remained high for some time inhibiting proper root-growth effecting the normal development of the shoot and lowering the grain yields on the medium deep soil. The grain crop on the light shallow soil practically failed for want of rain after sowing. At Bijapur the soil moistures were adequate in both types of soil throughout the whole growing period of rabi crop resulting in high yields in deeper soils. Germination studies with jowar and cotton seed, to ascertain the effect of the addition of green sann and castor cake have shown that some deleterious effect is caused in the case of cotton only for a short period after addition. Effect of different manipulations like pruning, defoliation and removal of tillers studied and it was found that any disturbance to the plant affected its normal growth adversely. Experiments with jowar and setaria have shown that the weight of the seed was significantly correlated with the percentage germination under field conditions.

(c) *Punjab* (*Rohtak*).—As the rains failed altogether no crop could be raised successfully. It was only under the rotational experiments that some results of importance were obtained from the fallow plots. *Guara* has been found to be the most drought resistant crop. *Bajra* came next while *urd* failed to show this resistance altogether. The system of leaving every year a portion of the land as fallow for one complete year has been found to be a sound practice. It has been found that the conservation of soil moisture is not effected by the depth of the soil but by the nature of the tilth. Soil mulch has been found to conserve moisture. It has also been found that there is more moisture in fallow crops than in those under constant cropping. Failure of crops may not always be due to deficiency of moisture but also from defects in soil structure and deficiency in soil nutrients. Physiological studies have shown that wheat 9-D (a medium ripening variety) grows quicker, sends its roots deeper and matures earlier and better than the late variety, 8-A. Similarly *bajra* local (an early variety) is better suited to dry conditions than *bajra* A 1/3 (a late variety). Early varieties of wheat, gram and *bajra* seem to have higher values of transpiration co-efficient than the late ones but the latter require more water.

(d) *Hyderabad* (*Raichur*).—Varietal trials with setaria and *jowar* showed that K 92 was the best yielder type 2 setaria while T 12 and N.D. 15, which had not done well in previous lean years were the best yielding types of *Jowar*. *Kharif Jowar* spacing experiments with *Kharif Jowar* indicated maximum yield with 12″ spacing closely followed by 9″ and 18″ spacing. The trend of the straw yield was reverse of that of grain and decreased with increased spacing. There was practically no difference between the yields of the Bombay Dry Farming Method and the 'Local' method which confirms the previous year's conclusion that Bombay Dry Farming Method was not applicable to *kharif* cropping. In the case of rabi crops also the local plots gave higher yields. Fallow experiments, both in the case of *Kharif* and *Rabi* crops, showed that the system of alternate cropping was the most suitable. In soil moisture studies the behaviour of soil moisture seemed to bear a definite relation with the nature and composition of the soil type.

CHAPTER III.

RESEARCH ON CROP PRODUCTION.

A. Soils & Fertilisers.

General.—The standing Soil Science Committee appointed by the Council met twice during the year in conjunction with the Advisory Board meetings and considered matters concerning soil research. In addition to various schemes, technical programmes and progress reports on current schemes, the Committee also considered the following general subjects:—

(i) Organisation of an all India soil survey and the appointment of a committee to define methods of soil analysis.

(ii) Results of the analysis of soils from certain provinces according to the various methods of soil analysis.

(iii) Constitution of a committee to consider black soil problems.

(iv) present position and future requirements of anti-erosion work in India.

The position in respect of these subjects is stated below.

(i) A comprehensive scheme for an All India soil survey is now under the consideration of the Imperial Council of Agricultural Research.

(ii) From the results of the data of soil analysis and their statistical examination, the Committee concluded that the International method should be employed in the dispersion of soil for mechanical analysis and that if, for any reason, another method had to be employed, either the alkaline permanganate or the hypobromite method could be used.

(iii) The Advisory Board has recommended the constitution of a small committee to consider black soil problems. This Committee is expected to meet sometime in 1940 when the data for its consideration became available.

(iv) The question of anti-erosion work was discussed also by the Central Fodder and Grazing Committee and the Crops and Soils wing of the Board of Agriculture and Animal Husbandry in India at its third meeting held in December 1939.*

A brief account of the work in progress under the various research schemes financed by the Council is given below.

Study of soil problems in Bengal.

The main activity during 1938-39 was confined to the generalised study of the soil drying processes elucidating the different factors which are responsible for the relation between soil and water. Attempts were made to give a theoretical interpretation of the principle governing the evaporation of water from soil. The manner in which the water at different concentrations exists in a soil was defined and a simple and reliable method was suggested for finding out the moisture content of the soil at the wilting point.

Measurement of soil resistance by means of a dynamometer and a plough showed how the different manurial treatments changed the texture of the soil so as to reduce the draw bar pull. The obvious relation between the soil moisture and the draw bar pull was established.

The proposal for extension of this scheme for a period of two years from 1st July 1940 was considered by the Soil Science Committee and the Advisory Board in November-December 1939. The Committee agreed to the extension of the scheme but recommended that during the period of extension, work should be confined to (i) evaporation of water from soil and the study of the physical properties of soil under field conditions associated with tillage operations with particular reference to the effect of various manures on drought and (ii) the variation associated with the physical constants of different types of soil, both of which have a direct bearing on the practical problems of the cultivator. Pending consideration of the proposal by the Governing Body at its next meeting, a short extension of the scheme upto the 30th September 1940 has been sanctioned.

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*A reference to this subject will be made in the section regarding the meeting of that body..

Mechanical analysis of lateritic soils and nutrition of the rice plant, Dacca University. (1938-39 and upto the middle of 1940).

(a) *Mechanical analysis of lateritic soils.*

The physico-chemical properties of soil samples collected on profile basis from different parts of Bengal, Assam, Bihar, Orissa and the Madras Presidency were determined. The mineral compositions of the profile samples were determined by means of a petrological microscope. Suitable microscopic sections of parent rocks of the profile samples were prepared and the mineralogical constituents of the parent material were determined under the microscope. In many instances the crystallographic forces of the quartz and the felspar grains could be recognised. The common ferro-magnesian rock forming minerals were represented by one or more species in all the soils examined, one or the other being present in preponderating amount. Hornblende was also commonly present. Epidote and Garnet were frequently found in granular form, whilst Tourmaline specially Zircorn, though sometimes fragmentary showed crystalline forms. Iron or minerals like Haematite, Limonite and Magnetite were present in all the soils examined. In the case of almost all the soil types it was observed that the mineral separations contain a large proportion of iron oxides and highly resistant weathered minerals, such as epidote, zircon, tourmaline etc. which suggests that the soil had been formed of prolonged chemical action which took place prior to soil forming processes.

Fixation of phosphates by Indian red soils was studied from two points of view—(*a*) uptake of phosphates from phosphate solution by soils after shaking the mixture of the soil and the phosphate solution for a certain time and (*b*) the fixation of phosphates by soils from phosphates solutions when the latter is brought into equilibrium with the soil by evaporation to dryness. It was found in general that upto about 30 minutes time of shaking, the phosphate fixation proceeds at a tremendous rate gradually falling off, becoming almost constant after two hours and remaining thus for the remainder of the period during which observations were made. When equilibrium was brought about by shaking, it was found that Indian Bauxite possess the maximum power of retention of phosphates whilst Kaolin possesses none. The capacity of magnetite was not appreciable, whilst the hydrated iron-bearing mineral limonite and the titanium bearing mineral limonite possesses almost the same power of retaining phosphates. The absorption of phosphates by shaking was highest in the case of the profile samples from Nilgiri Hills (2) (5000/a.s.l.)* and Nilgiri Hills (3) (7000/a.s.l.)* and was considerably greater than in the case of ordinary iron-bearing or titanium bearing minerals. When equilibrium was brought about by evaporation of the mixture to dryness limonite showed maximum power of phosphate fixation, next in order being haematite. Of the gels studied Fe_2O_3 and TiO_2 possess very high power of phosphate fixation and that by Al_2O_3 was also considerable. There was no correlation between the quantity of phosphate fixed by ignited and non-ignited soil. The p. p. m.† of P fixed increased with the percentages of sesquioxides in hydrochloric acid extract.

Soil monoliths and profile samples were collected from various places and their morphological features were studied.

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* Feet above sea level.

† Parts per million.

(b) *Nutrition of the rice plant.*

Experiments with a few rice-fields showed that the fixation of N in them under waterlogged condition was much greater in presence of crop than in its absence. If the soil is treated with N free nutrients the fixation is even greater.

In the absence of crop, however, the addition of P or K singly or in combination does not seem to have any beneficial effect on N fixation.

A detailed examination of the N fixation bacteria occurring in rice soils was undertaken. *Az. indicum* was found to be absent in all soils having pH above 6. Three different cultures were isolated from Assam soils of which one appeared to possess certain characteristics different from those of *Az. indicum*. A detailed examination of this organism is in progress.

Experiments with pure cultures of algae showed that in the presence of organic N compounds they were capable of fixing N, although a few of them appeared to have a depressing effect on their growth. There was no accumulation of ammonia when algae acted on organic N compounds of narrow CN ratio.

INVESTIGATIONS OF THE ORGANIC CONSTITUENTS OF INDIAN SOILS, CARRIED OUT AT THE DACCA UNIVERSITY.

Samples of eight soils from the Basu Manurial Experimental plots of the Dacca Farm were collected and prepared for analysis. The total Organic matter, N-content and pH of the soils determined in all the samples, and crude humic acids from two of those were isolated and some of their properties investigated.

Work on the analysis of the Putida soil was continued and studied under identical conditions.

The following table summarises the results of the analysis

Table.

Change in the composition of Putida Soil, before and after the alkali treatment.

	Original soil.	Soil after alkali treatment.
Carbon	1·16	0·114
Nitrogen	0·136	0·050
C/N ratio	8·54	2·288

The Scheme has been extended for a period of two years from November 1939.

SCHEME OF RESEARCH ON COLLOID SOIL CONSTITUENTS.

The progress report on the work done under the scheme during 1938-39 was considered by the Soil Science Committee and the Advisory Board in November-December 1939. During the year under report work on pure systems was continued but was restricted to such problems as are related to some outstanding points. The previous work on hydrogen clays was extended to clays isolated from other soils. The amounts of Al displaced in the supernatant liquids of hydrogen clay + salt mixtures were estimated

and correlated with the amounts of the cation of the salt absorbed and the titratable acidity of the supernatant liquid. A study was made of the base exchange capacity, the content of exchangeable bases and exchangeable hydrogen and the pH of the water and KCl suspensions of some Indian soils using different methods of estimation.

Composting of town refuse and waste materials.

The previous annual report contains a brief account of the work that has been carried out under the scheme since its inception in 1935. A proposal for extension of this scheme for a period of 3 years from 1st January 1940 was considered by the Soil Science Committee and the Advisory Board in November-December 1939. It was decided to cut down the programme of work under the Scheme limiting it to work on light soils only and to recommend the extension for two, instead of three years, with the proviso that the work should be completed within that period and the scheme then terminated. A monograph on the results so far obtained from work on composts in India by the officer in charge of the scheme is expected to be published by the Imperial Council of Agricultural Research in due course.

Research on nitrogen loss and nitrogen fixation in soils.

A full reference to the work carried out under the scheme upto and including 1937-38 was given in the last annual report. This scheme terminated on the 31st July 1939 and a final report on its working is awaited from Dr. N. R. Dhar.

Reclamation of alkaline and usar lands by treatment with molasses and press cakes.

The scheme was submitted by Dr. N. R. Dhar of the Allahabad University for research experiments on reclamation of alkaline and usar lands by treatment with molasses and press cakes. It was approved in 1938 and funds were allotted in August 1939. The scheme provides for investigating physically, chemically and bacteriologically bad alkaline and usar lands before and after treatment with reclaiming agents like molasses, press cakes, ammonium sulphate, ferric alum, gypsum and powdered sulphur. The Soil Science Committee which considered the scheme in the first instance recommended that a proper field experiment should be laid out on two types of usar soils for two years on adequately replicated plots to see the effect of molasses on the crop yield and also to study the chemical and bacterial changes. The revised technical programme of work was approved by the Advisory Board in May 1939. Work under the scheme has been started recently.

Work on problems relating to coastal soils.

Professor J. N. Mukherjee of the Calcutta University submitted a scheme for work on problems relating to coastal soils. There are extensive regions of coastal soils in India which present very important problems of theoretical and practical interest in soil science. These soils differ in several important respects from those formed by the weathering of rocks *in situ* as also from inland alluvial soils. The close proximity of the saline sea water and the presence of marine deposits of vegetable as also of animal origin and the variations in their conditions of formation give rise to a range

of peculiar soil characteristics. A collation of the experimental materials and a systematic investigation on these soils are the objects of this scheme. The successful completion of the work is expected to lead to amelioration of unfavourable soil conditions and be of direct economic interest. The scheme was approved in 1938 and funds allotted in March 1939. It was initiated from September 1939. The programme of work was approved by the Advisory Board in December 1939. It includes work on the pan soils of the Bakharganj District, Bengal, in the first year and in the second year on similar soils occurring in 24-Parganas, Bengal. The survey in the first instance will be of an intensive character restricted to the Bengal Government Farm at Barisal and its neighbourhood.

SUB-SURFACE INVESTIGATION WORK IN THE LLOYD BARRAGE AREA IN SIND.

As a result of the opening of the Lloyd Barrage Canals in Sind, the Government of Sind had been carrying on work on soils and sub-soils, sub-soil water and silt. These investigations point to the necessity for further intensive research work for which the Government of Sind submitted proposals to the Council. Under the scheme, soils will be studied on the basis of profile development to arrive at a scientific system of soil classification. The sub-soil investigation will include seasonal and depth movement fluctuations in the composition, the relationship between the composition of the irrigation water and sub-soil water and the influence of sub-soil water on the moisture and salt profile. The investigations are expected to yield valuable information on the formation, development and reclamation of Kalar soils under Indian conditions. The scheme was approved during the year and funds have recently been allotted. The main laboratory will be located at Karachi.

KANS ERADICATION PROBLEMS.

The Imperial Council of Agricultural Research has made a grant to the Government of Bhopal for a scheme of research on the studies of *Kans* eradication problems. It provides for a study of:—

(1) the extent of *kans* infestation in different soils;

(2) the soil moisture content and the plant moisture content at the time of the actual death of the plant;

(3) the effect of sunlight and heat in killing *kans;*

(4) the life-history and morphology of the *kans* plants;

(5) amount of regrowth in fields ploughed at noon dates.

The work is expected to be started shortly.

WATER REQUIREMENTS OF CROPS.

The Council sanctioned a scheme in the Punjab in 1938-39. The main items in the programme of work are:—

(1) Study of effect of varying numbers of irrigations of the same depths on the yields of each of the principal crops.

(2) Study of effect of frequent light irrigations and their comparison with heavier irrigations at longer intervals.

(3) Study of effect of varying time of application of water.

(4) Study of the effect of deep and shallow preparatory tillage on moisture conservation.

(5) Study of effect of inter-culture on the conservation of soil moisture.

(6) The best way to prepare land in order to spread the available water supply over the largest area.

(7) The value of "Kiraries" (beds) for discharges of water.

(8) The relative quantities of water required for crops when sown on (*a*) the flat and (*b*) ridges, and the effect of these systems on yields.

(9) The application of the results obtained to Zamindari conditions and practices.

The first report on the progress of work done is awaited.

CHAPTER IV.

AGRICULTURAL METEOROLOGY.

The Imperial Council of Agricultural Research continued to finance the scheme during 1939-40 also, pending a decision by the Government of India on the question of placing the section on a permanent footing as part of the India Meteorological Department.

During the year the instrumental equipment as well as the central Agricultural Meteorological Observatory were extended. Experiments were continued on the movement of moisture and heat in the air and soil layers near the ground, the micro-climates of crops, the intensity of solar and sky radiation and the thermal balance at the surface of the ground, evaporation and transpiration, exchange of moisture between plant materials and the atmosphere and the seasonal variations of the nitrogen content of the surface layers of the soil. A new instrument was evolved for measuring the amount of rain or irrigation water lost by evaporation and percolation, and that actually retained by the soil. The issue of cold wave warnings to the provinces and states liable to their incidence was continued and were generally found to be very useful.

Progress was made with certain statistical investigations of general interest *e.g.*, the date and type of onset of the South West monsoon along the west coast of peninsular India, the secular variation in the frequency of frosts in Gujerat etc.

The Government of India have since agreed to take over the scheme and finance it from the Central revenues, for a period of three years in the first instance. The work done will however be reviewed annually by the Imperial Council of Agricultural Research.

CHAPTER V.

PLANT BREEDING & GENETICS.

Botanical Sub-station, Pusa.

Further progress was made in the work of breeding and testing of crop varieties suitable for North-East India. From the F_4 generation of wheat crosses a number of fully bearded and early maturing hybrids showing resistance to rusts under field conditions, have been selected. Fifty strains of barley were tested against a mixture of six physiologic races

of black rust by Rai Bahadur Dr. K. C. Mehta. None of them was found to be immune. Dwarf rust (Puccinia simplex) was recorded on barley perhaps for the first time in the plains of India. From pigeon-pea type 69, which is one of the promising varieties, wilt-resistant strains were isolated. When compared to the original type they showed a marked degree of resistance to wilt disease.

Yield trials of wheat and paddy varieties were carried out. Preliminary trials were also conducted with Pusa types and hybrids of oats and barley. The trial with Pusa oats to determine yields of green fodder, grain and straw, was repeated during the year under report, this time both under non-irrigated and irrigated conditions. Most of the varieties were observed to respond to irrigation. The interaction between varieties and irrigation was significant only in the case of yields of straw and not in respect of yields of green fodder and grain.

The permanent manurial and rotation experiments as well as the new manurial trials were repeated as usual. Full confirmation was obtained with Pusa 52 wheat regarding the undesirability of applying fermented rape cake mixture to *rabi* crops.

The effect of time of sowing on incidence of sterility in pigeon-peas was investigated and it was observed that late sowings were associated with higher percentage of sterility.

Selection work in maize, soy-beans, pigeon-peas, etc., and genetical and other miscellaneous studies in barley, oats and pigeon-peas were continued. Multiplication of pedigree seeds of different crops and their distribution received the usual attention at the Sub-station.

In addition, the Sub-station continued to be the centre for post graduate training in conditions different from those at the Imperial Agricultural Research Institute, New Delhi, and for the two months' course in tobacco flue curing. It also continued to provide facilities for the investigations on leaf curl disease of tobacco and study of sugarcane pests, which are also financed by the Imperial Council of Agricultural Research.

The existing sanction for the scheme will expire on the 30th September 1940 and the Council has under consideration proposals for its continuance for a further period.

Medicinal Plants Scheme.

The year under report was the final year of the scheme, which was initiated in March, 1935.

During the year the monograph on 'Poisonous plants of India' was completed, and work was done on the role of adulterated mustard oil in the production of epidemic dropsy.

Mustard seeds were found to contain adulterants, chiefly, *Argemone mexicana Linn.* The effects of mustard oil with definite proportions of this adulterant were tried, and the symptoms produced were found to be identical with those of epidemic dropsy. Experiments with animals in the laboratory showed that argemone oil is definitely toxic but that it can be rendered harmless if heated to a temperature of 240°-C.

A number of medicinal plants and poisonous plants were chemically and pharmacologically analysed during the year, pyrethrum being one of the insecticides tested.

This herbarium now comprised about 1,600 species or 6,000 specimens.

A large amount of data in connection with the distribution of medicinal and poisonous plants has also been collected. This will be particularly useful in throwing light on the distribution of poisonous plants in grass lands and pastures where they are a menace to livestock.

A proposal for the extension of the scheme for a period of three years to bring the extensive work undertaken to its logical conclusion has been recommended by the Advisory Board and is awaiting approval by the Governing Body.

Prospects of increasing cinchona cultivation in India.

The Royal Commission on Agriculture emphasised the importance of cheap quinine. On the advice of the Indian Research Fund Association, the Central Advisory Board of Health in July 1937 resolved that an officer experienced in cinchona cultivation should investigate areas most suited to its cultivation and the cost of production. The Imperial Council of Agricultural Research arranged and financed this investigation. Mr. A. Wilson, Deputy Director of Agriculture, Cinchona, Madras, was appointed to conduct the investigations assisted by Dr. T. J. Mirchandani, then Agricultural Chemist, Bihar.

A comprehensive report giving the previous history of cinchona cultivation and a survey of the areas likely to be suitable for cinchona planting was prepared by him and has been published by the Imperial Council of Agricultural Research as a Miscellaneous Bulletin.

Mr. Wilson's finding is that India contains enough first class land for an early expansion of cinchona cultivation. India, however, produces only 70,000 lbs. of quinine but consumes 210,000 lbs. and therefore, imports 140,000 lbs. mainly from Java. India's real need of quinine however, has been estimated at 600,000 lbs. The importance of extending cinchona cultivation in India is therefore, apparent.

Tracing the previous history of Cinchona cultivation in India from 1835, Mr. Wilson mentioned that within a short period of thirty years, the plantation industry had been abandoned by private enterprise, following overproduction and a catastrophic drop in prices. All that remained in India were the Cinchona Plantations belonging to the Governments of Madras and Bengal. These were the pioneers in the work of establishing the plant in India from seed obtained from South America. They continue to exist besides plantations of private growers who supply the Government quinine factories with cinchona bark. Simultaneously, Java by unremitting scientific work, aided by optimum conditions for growing cinchona, gradually obtained a complete command of the world's quinine market which it now dominates to the extent of about 97 per cent.

The two important species utilised by cinchona plantations in India are known as *Cinchona ledgeriana* which predominates in Bengal and *Cinchona Succirubra*, the red bark variety. The latter presents certain advantages for certain soils and elevations but the former has much greater commercial potentialities especially on account of its high content of invaluable alkaloid. It is on this variety that Mr. Wilson recommends that future attention should be concentrated.

In cinchona growing, elevation aspect and soil are also of primary importance. The investigation included a survey of likely areas and a study of the cinchona soils. The report also contains estimates of the cost of production of cinchona bark and consequent prices of medicinal preparations from it, of converting bark into quinine and into the mixed alkaloids, a cheaper preparation, commonly called totaquina. While no great reduction in the cost of quinine is foreshadowed, the figures show that in suitable areas quinine could be produced in India at world market prices

Mr. Wilson emphasises the need for research and experiments in a number of directions. Any area selected for development should be tested in the first place by small properly organised experiments to determine the yields of bark, the difficulties to be overcome and the cost of production. The need for more fundamental research is also emphasised. Amongst the stock of cinchona plants at present existing in the country there are undoubtedly strains of superior plantation performance and containing a much higher percentage of quinine than the commercial mixed crop. By suitable methods these could be isolated and multiplied. Further experimental work is also required on the improvement of cultivation methods and in the reduction of the cost of extraction and distribution of the quinine.

With a view to give effect to the recommendations of Mr. Wilson, the Council has under consideration a comprehensive scheme of research drawn up by Mr. S. C. Sen, Superintendent, Cinchona Cultivation, Bengal. It provides for two research stations, one in the North and one in the South, both to work according to a single plan and not independently of each other. To each station will be attached State nurseries and test plots will be laid out in selected areas. The research stations will carry out a comprehensive programme of research, involving work of a fundamental nature as well as investigation of the immediate problems of cultivation including work on soils and genetical, chemical and physiological studies. The immediate object of the State nurseries will be the supply of planting material to new concerns, but ultimately intended to place the present empirical methods of nursery work on a scientific basis. The test plots will be used to determine the suitability of land for growing cinchona.

Researches in vernalisation.

It has been found that the response to vernalisation of different strains of the same crop is not identical. None of the Indian wheats tried have any response whereas both Yeoman and Holdfact (foreign types) gave excellent response. In the case of cotton response to vernalisation has been observed in only one strain, *viz.*, Sea Island. The maximum earliness so far observed in vernalised plants of mustard Type 27 is 29·7 days, in C 11 only 9 days, in Type 9, 33·7 days, in yellow sarson, 24·8 days and in brown sarson 3·45 days. Linseed P 12 has given a striking response showing an earliness of 60·75 days, but in C 1150 there was an earliness of only 10·8 days Sea Island Cotton has given an earliness of 11 days.

Unsplit vernalised mustard seed offers practical agricultural possibilities. It can be dried without affecting its subsequent germinating capacity. It has been found that when the dried seed is stored in low temperature the induced vernalization is unimpaired

CHAPTER VI.

PLANT DISEASES & PESTS.

Research work on pan cultivation.—The Council has made a grant to the Government of the Central Provinces and Berar, for a scheme of research on '*pan*' cultivation, the main purpose of which is to study the causes of pan diseases and to evolve remedial measures. The work is intended to be carried out in a series of pan gardens which will be planted in important pan growing districts. The cultivation of this crop has become unremunerative on account of incidence of various diseases and the scheme is expected to yield results of economic value. The technical programme of work has been approved and the scheme is expected to be initiated early in 1940-41.

Combined scheme for an entomological survey in the Punjab and the North-West Frontier Province.

This is a three years scheme which was started in April 1937 and has just expired. It has been devoted to a study of the localities where the san jose scale is prevalent the food plants attacked by this pest and the life history of the pest itself. The three years work has yielded valuable results. Various other scales such as the wooly aphis, mango, hoppers, peach, curl aphis, Aphelinus mali, etc., which were met with during the survey were also studied. Observations were recorded on a number of lepidopterous pests of fruit trees including codling moth whose life history has been studied in detail. A large number of fruit flies (Diptera) were recorded in the North-West Frontier Province and the Punjab. The fruit fly problem in these two provinces is very acute and demands immediate attention.

A final report on the work done under the scheme has just been received and is expected to be published in due course.

San jose scale and Wooly aphis Survey in Kashmir.

This scheme was initiated in 1939-40. The main items of work are—

(A) *San jose Scale*—

(1) a completion of the survey down to the lowest altitude at which the pest survives in the jungle;

(2) the improvement and cheapening of control methods and the testing of their effectiveness;

(3) the improvement and cheapening of fumigation methods and the testing of their effectiveness and the study of the incidence of the pest on different varieties.

(B) *Wooly aphis*—

(1) Confirmation of the non-existence of root forms of the pest in Kashmir,

(2) to try in Kashmir stocks known to be susceptible to the root forms, and

(3) to try in India after fumigation stocks from Kashmir believed to be resistant to root attacks.

The investigations will concentrate on the control of the pests and will include a study of the bionomics, behaviour, ecology and pathology of the two pests.

Virus diseases research.

The Council has made a grant to the Government of Bombay for a general survey of the virus diseases prevalent in the Bombay Presidency and investigations into the specific virus diseases of three crops, *viz.*, chillies, cardamom and *bhendi*. These diseases have been causing great damage every year and results of definite economic importance are expected to accrue from the scheme. The Plant Pathologist to the Government of Bombay whom the Council deputed to certain foreign countries for a study of the problems as they existed elsewhere, is in charge of the scheme. Work was initiated in 1938 and a report on the progress so far made is awaited.

CHAPTER VII.

AGRICULTURAL ECONOMICS.

In 1937 the Council made a two year grant to the Gokhale Institute of Politics and Economics in Bombay, for a scheme of research in agricultural economics. It was completed in June 1939 and a final report on its working has been submitted to the Council. The Institute has also applied for the continuance of the work for a further period of three years and this is now under the Council's consideration.

2. The scheme is in main a methodological project and its objective is to find out whether the survey method of farm business studies is applicable to Indian conditions and if so what adaptations would be rendered necessary by the peculiar circumstances of this country. It has been claimed that the special advantages of the survey method are "speed, cheapness and a much more comprehensive picture of the economic condition of farming" and that the method is one particularly of value in investigations of India's agricultural economy.

The final report gives full particulars of the tracts surveyed, the kind of farmers engaged therein, the nature and activities at the various farms, crop combinations adopted by the farmers, extent of labour employed, expenditure and receipts and general remarks on the conditions of farm economy in the tracts. The Advisory Board of the Council considered the report to be a useful addition to the literature on Indian agricultural economics. The report will be published in due course.

SCHEME OF STATISTICAL STUDIES. (PROF. P. C. MAHALANOBIS).

The theoretical studies and applied researches in regard to Galois fields and associated finite geometry as outlined in the last year's report were continued. Training work of officers and post-graduate students in modern statistical methods as applied to biological and agronomic fields was also undertaken. Advisory work was taken up as usual.

2. The Council has also sanctioned a scheme for the preparation of tables for the studentized form of D^2 statistics. The importance of D^2 statistics in problem of classification in various fields specially in biological and agronomic fields is now well recognised. The preparation of these

tables for the classical form of the Generalised Distance has been practically completed, with the help of a special grant made by the Imperial Council of Agricultural Research in 1937 and will be shortly published It was, however, necessary to prepare similar tables for the studentized form of the generalised distance. This work will now be undertaken with the help of the grant of Rs. 2,000 sanctioned by the Council for one year.

CHAPTER VIII.

CROPS AND SOILS WING OF THE BOARD OF AGRICULTURE AND ANIMAL HUSBANDRY IN INDIA.

The third meeting of the Crops & Soils wing of the Board of Agriculture and Animal Husbandry in India was held at New Delhi from the 6th to the 9th December, 1939. A statement showing the resolutions passed by the Board on the various subjects discussed by it will be found at appendix XIII.

CHAPTER IX.

FODDER CROPS & GRASSES.

The third meeting of the Central Fodder and Grazing Committee was held on the 30th November 1939. The following are the important items that were discussed:—

(1) *Plantation of fodder trees.*—In the United Provinces a special officer had been appointed to encourage the plantation of trees to produce fodder and fuel for the villagers. His efforts had met with considerable success and the question of legislation to permit control of all waste lands was under consideration. Meanwhile propaganda was being carried on. A somewhat similar system was proving successful in Madras. It was pointed out that the most important matter was first to investigate the relative nutritive value of grasses and fodder trees before projects to undertake their plantation could be considered. In Bombay the plantation of fodder trees was not encouraged, as it was considered that if the cultivators would find a cheap and easy food for cattle from trees, they would not take the trouble of providing against periods of scarcity by storing grass or other fodders which were decidedly superior as cattle feed. *Babul* (*Acacia arabica*) was proving useful as a scarcity fodder in Sind and the Government were giving concessions for *babul* plantation. There was however urgent need to try some quick growing trees like *Shevri* (*Sesbania aculcata*) which was proving a useful plant for the dry regions. It was observed that no information was available regarding the quantity of fodder tree loppings required per animal. The Committee was informed that from the point of view of chemical analysis the loppings of trees like *shisham* (*delbergia sisso*), *peepal* (*ficus religiosa*), *ber* (*Zizyphus jujuba*) and *acacia* were in certain respects equal to wheat bhusa and it was worth while encouraging their plantation especially in arid areas. The Committee finally recommended the plantation of fodder trees in arid regions where there was a scarcity of grasses and suggested that in respect of other areas experiments should be carried out to ascertain the yield and nutritive value of fodder trees and the number of cattle that could be maintained per acre therefrom and to determine the best lopping technique.

(2) *Reports on the work of provincial and state fodder and grazing Committee.*—It was pointed out that the present system of working by the Provincial Committees was not satisfactory and some control over their working was necessary. There should be some executive body either at the centre attached to suitable Institute or in the Provinces to see that the work was carried out properly. The representatives of the Punjab and the United Provinces, however, differed from this view and said that the work was carried on smoothly on the recommendations made by the Provincial Committees and no such necessity of an executive control arose. The Committee felt that the only effective way of implementing the recommendations of the Provincial Committee was to draw the attention of the Provincial Government and the Department concerned to the matter.

(3) The desirability and feasibility of storing grass for long periods against years of bad rainfall was discussed. Reference was made by the Livestock Expert to the Government of Bombay to a plant devised and worked by him for artificial drying of green grass in young condition when it was very nutritious. The plant was simple to work, cheap and portable and the moisture content of the fresh grass could be reduced from 70 per cent. to 7 per cent. during the monsoon period when under ordinary conditions it was difficult even to dry the grass. The plant could dry grass at the rate of three cwts. per hour and was considered quite a suitable piece of machinery to cope with the large quantity of grass available during monsoon. Grass cut at short intervals was an ideal food for cattle as it provided a fairly rich source of protein. The Committee therefore recommended that the apparatus be given a trial. Some members considered that silage making was the best method of preserving cattle food. The Committee also generally agreed that the preparation of silage should be encouraged but it was held that this method owing to transport difficulties would not help to solve the problem of fodder supply in years of famine and it was therefore necessary to arrange for the storage of fodder which would be available in times of need.

(4) The Committee considered a note by the Agricultural Commissioner with the Government of India on the present position and future requirements of anti-erosion work in India and recommended that a sub-committee of the Central Fodder and Grazing Committee be constituted to formulate concrete proposals for carrying out co-ordinated work on this problem. The subject was also considered by the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India which passed a comprehensive resolution for co-ordinated action in all the provinces and States to check the menace of soil erosion.

The Committee also considered schemes on Mixed Farming from the United Provinces, North-West Frontier Province, Sind and Orissa and recommended a standard scheme which could be applied throughout India with modifications to suit local conditions. The schemes are under consideration.

The Council also obtained certain grass samples from abroad for trial in India in order to find out whether some of the good fodder varieties can be acclimatized and propagated in this country. These included *Subterrenean* and *Strawberry clovers* from Australia, *Trifolium jolustinii* and certain *Digitaria spp.* from South Africa and *Agropyron smithii* and *Boutelona gracilis* from the United States of America. Trials with these are in progress in different parts of the country.

Section II—Sugar.

CHAPTER I.

(i) *Standing Sugar Committee.*—A statement showing the various recommendations made by the Committee at its eleventh meeting held in May 1939 and the decisions of the Governing Body thereon is appended (Appendix XIV). It will be observed therefrom that the Committee considered nineteen progress reports. two technical programmes, two extension schemes and six new schemes, besides examining several miscellaneous items and the recommendations of the Tariff Board on the sugar industry. The most important recommendation made by the Committee was in regard to the convening of an All-India Sugar Conference and the constitution of an Indian Central Sugar Committee on the lines of the Indian Central Cotton Committee.

(ii) *All-India Sugar Conference.*—In para. 208 of their report, the Indian Tariff Board on the Sugar Industry, 1938, recommended the rationalisation of the industry under some form of state control and for this purpose they suggested the convening of an All-India Conference representing all interests at an early date. This recommendation was endorsed by the Imperial Council of Agricultural Research and was accepted by the Government of India in August 1939. The Government of India also accepted the suggestion of the Governing Body of the Council that a small Committee consisting of (1) the Hon'ble Dr. K. N. Katju, (2) the Hon'ble Sir Chhotu Ram, (3) the Hon'ble Dr. Syed Mahmud, (4) the Hon'ble Mr. Hossain Imam, (5) Mr. D. P. Khaitan, (6) Lala Shri Ram, and (7) The Vice-Chairman, Imperial Council of Agricultural Research, should be requested in the first instance to scrutinise the suggestions received from different quarters and put up concrete draft resolutions for consideration of the Conference.

The Provincial Governments, Indian States concerned and important Sugar Associations were accordingly asked to send by the 15th November 1939 their suggestions to the Imperial Council of Agricultural Research, especially their views on such matters as the regulation of cane production, payment of premium for special varieties of cane, legislation for zoning, licensing of factories, appointment of controlling bodies, establishment of industries subsidiary to Sugar and of a central marketing organisation.

While replies were being received from different quarters conditions in India and elsewhere became unstable owing to the outbreak of war. Under such circumstances it was considered inopportune to convene the Conference with the object of concerting measures for stabilisation of the Sugar Industry. The Government of India accordingly decided in November 1939 not to proceed with the proposal until the situation became clearer.

(iii) *Indian Central Sugar Committee.*—The Governing Body of the Council at its meeting held in July 1939, approved of the proposal of the Sugar Committee for the establishment of an Indian Central Sugar Committee in principle, and decided that the question as to how it should be constituted and financed and what exactly its functions should be might be further examined in consultation with Provincial and State Governments and Associations and other bodies interested in Sugar, by the

Special Sub-Committee constituted for the purpose of examining suggestions in connection with the all-India Sugar Conference. This Committee was required to formulate a scheme to be put up for approval to the Governing Body which would then make its recommendations to the Central Government.

The Provincial Governments, Indian States and Sugar Associations were accordingly requested to furnish the I. C. A. R. with their views regarding the constitution, finance and functions of the proposed Central Sugar Committee. Replies are still due from a few provinces and as soon as the views of all concerned are received it will be considered what further action should be taken in the matter in the present circumstances of the country.

(iv) *Work on Insect Pests.*—On the recommendation of the Entomological Sub-Committee which met in November last the Advisory Board agreed to revise the programme of work on Sugarcane Insect Pests so as to carry it out more expeditiously and efficiently. With a view to keeping the expenditure on the scheme as a whole within the total grant originally sanctioned by the Governing Body for 17 stations at the rate of Rs. 4,000 per annum per station, it was decided to discontinue work at 8 stations (*viz.*, Anakapalle, Berhampur, Shahjahanpur, Partabgarh, Lyallpur, Mandya, Gaya and Nizamabad) and to carry on the work at the remaining nine centres (*viz.*, Gudiyattam, Padegaon, Dacca, Muzaffarnagar, Gorakhpur, Gurdaspur, Banki, Siwan and Pusa), on a more intensive scale.

The revised scheme was approved by the Governing Body and was brought into operation early this year.

(v) *Biological control of sugarcane pests.*—At its meeting held at Simla in July 1939, the Governing Body decided that a further note on biological control of sugarcane pests which should include all available information obtainable in regard to this work all over India should be prepared and circulated. The Directors of Agriculture in the Provinces and Constituent States of the Imperial Council of Agricultural Research were accordingly requested to supply all the available information on the subject to Mr. P. V. Isaac, Second Entomologist Imperial Agricultural Research Institute, New Delhi, who was entrusted with the work of compiling this information. A note entitled 'Summary of work done on biological control of sugarcane pests' was accordingly prepared by him, and circulated to members of the Governing Body for consideration at their next meeting.

(vi) *Funds for Sugar Research.*—The following further grants have been received from the Government of India for Sugarcane research work:—

During 1939-40—Rs. 2·28 lakhs.

During 1940-41—Rs. 3 lakhs.

As regards expenditure on sugarcane schemes attention is invited to the accounts of the Council for 1939-40 (Appendix V).

(vii) *Publications.*—A revised edition of the pamphlet "Summary of some Practical Results of Sugarcane Research in India" containing an account of the work done at several sugarcane research stations financed

by the I. C. A. R. is being published. This will be translated into Hindi and Urdu for the purpose of giving it wide publicity.

(viii) *Sugar Marketing Survey.*—To ensure progress on sound lines it was considered necessary to collect and compile complete information on all aspects of the production and distribution of sugar (including refined sugar and manufactured products). A sugar marketing survey was accordingly taken in hand towards the close of 1937. Pending the formation of the proposed Central Sugar Committee, the Government of India agreed to finance the scheme out of the balance in the Central Reserve Sugar Excise Fund. In March, 1938, the proposal to set up a Sugar Committee was dropped and the Government of India made a grant of 3½ lakhs rupees to the Imperial Council of Agricultural Research for sugar-cane research schemes and the scheme for sugar marketing survey was declared to be the first charge on that grant. During this period much useful information relating to the various aspects of the industry was collected.

With a view to ascertaining the proportion of the cane crop used for different purposes, *e.g.*, seed, chewing, manufacture of gur, khand, etc., in respect of which no reliable information was previously available, a detailed investigation on the basis of the proforma questionnaire was arranged to be carried out in the rural areas through the district staff of the local Agricultural Departments. The data then made available was largely supplemented by personal investigations undertaken by the Marketing Staff. A detailed study was also made in regard to qualitative aspect of demand, the price spreads due to differences in quality and the system and cost of marketing.

At an informal conference held at Delhi with the Director of Industries and the Assistant *Gur* Development Officer, United Provinces, the Marketing Staff put forward sugestions for development of the production and marketing of *gur* in eastern districts of the United Provinces. The Marketing Staff also prepared a scheme for the organisation of co-operative societies for the marketing of cane juice in the Rohilkhand division of the United Provinces where the producer is understood to receive only about two-thirds of the price for the juice paid by *khandsaris*. The question of improving the existing machinery for the marketing of *gur* in the North-West Frontier Province also received attention.

During the year under report the Marketing Staff were busy collecting and compiling detailed information regarding the different kinds of sugar and sugar products. A detailed survey regarding the production of palm sugar was also carried out and necessary information collected. The compilation of the all-India survey report was in progress. Draft grading and marking rules for sugar cane *gur* (jaggery) were prepared. Arrangements were made for the grading of *gur* at Cawnpore and Coimbatore on an experimental basis.

CHAPTER II.

Imperial Institute of Sugar Technology.

(i) *Industrial and Technical.*—The progress of the Indian sugar industry on its technical side is shown by an analysis of the average percentage recovery of sugar from cane in different provinces of India during the season 1938-39 compared with that of the previous season.

Average percentage recovery of sugar from cane during the season 1938-39.

Particulars.	Average percentage Recovery of Sugar from Cane.							
	1938-39.				1937-38.			
	U. P.	Bihar.	All other provinces.	All India.	U. P.	Bihar.	All other provinces.	All India.
Maximum	10·09	9·96	12·25	12·25	10·86	10·43	11·63	11·63
Minimum	7·41	8·20	6·00	6·00	6·49	6·56	5·88	5·88
Average	9·14	9·00	9·91	9·29	9·18	9·58	9·77	9·38

The highest recovery for the season was 12·25 per cent, as against 11·63 per cent, during the preceding season. The average extraction for the whole country shows a decline of 0·09 per cent, due primarily to the lower recovery in Bihar. The recovery in provinces other than U. P. and Bihar increased by 0·14 per cent. The mean recovery in the U. P. was low being only 9·14 per cent, but not much lower than in 1937-38 was only 9·18 per cent. Compared to the mean recovery of 9·65 per cent. in 1936-37, it marks a drop of 0·51 per cent.

The work under Sugar Production Rules, 1935, was continued as usual with some amendments in the forms appended to these rules. Consolidated statements of (*i*) Monthly Manufacturing data, (*ii*) Total price paid for cane and the net price actually received by the grower (monthly) and (*iii*) Sugar Production and Stocks (fortnightly) in respect of central sugar factories were compiled, cyclostyled and distributed regularly. Short summaries in English, Hindi and Urdu of the various consolidated statements, memoranda, notes and Review of the Sugar Industry, of general public interest were released for publication in the Indian News papers through the Principal Information Officer of the Government of India simultaneously with the issue of the main statements for publication in the Indian Trade Journal.

On the basis of the results submitted in the final manufacturing reports for the season 1938-39, in form E2, which were obtained with their existing equipment reported in the Schedules of Machinery in form I1, notes pointing out defects and suggesting methods for effecting improvements in the working were sent to all the factories individually. These were highly appreciated by the factories.

A survey of the famous *misri* industry at Kalpi, district Jalaun, was carried out during the year under report.

The Governments of the United Provinces and Bihar were advised regarding extensions, alterations, additions and replacements of plants by central sugar factories who applied under the Sugar Factories Control Rules. The Government of the United Provinces were also advised regarding cane quality, which necessitated a number of visits to sugar factories in the affected areas.

Anticipating the difficulties the sugar factories may experience as a result of war in obtaining some of their imported supplies of machinery parts, new machinery, sulphur and other chemicals, prompt steps were taken for rendering all possible assistance to them. Information regarding the supplies obtained as a result of thorough enquiries was supplied to the factories enabling them to get their requirements without any dislocation. The possibility of manufacturing in India many of the chemicals and other materials required by sugar factories is also under investigation.

Technical enquiries received from sugar factories and the public were suitably dealt with and specifications for plants and schemes for starting new factories were also prepared.

Pamphlets in English, Urdu and Hindi suggesting improved methods of *gur* and sugar manufacture by open pan system have been compiled and issued. Technical advice for carrying out work under the *Gur* Development Scheme of the Government of the United Provinces was also given.

In order to establish and maintain contact with the sugar factories and enable them to be in touch with research work carried out at the Institute, the system of issuing under the title "Sugar Notes" brief summaries of such work was begun during the year under report. The factories have been appreciating this service.

There was a heavy demand of the services of the Director and other technical staff of the Institute for giving technical advice on the various problems and difficulties experienced by sugar factories in their working The following table shows the varied nature of activities in this connection:—

1. Schemes drawn up and examined.	5
2. Specifications drawn up	10
3. Run and final manufacturing reports scrutinized . . .	45
4. Number of visits paid by the Director and the other technical staff to factories for technical advice	43
5. Technical advice regarding Boiler Furnance design . .	6
6. Number of sugar factories helped in recruiting their technical staff	31

(ii) *Research and Experiments.*—During the year under report the following experimental and research work was in progress in the undermentioned sections of the Institute:—

(*a*) *Division of Sugar Engineering.*—The machinery of the Experimental Sugar factory was extensively altered during the off-season in order to render it more suitable for testing, and for conducting experiments on engineering problems. During the crop period testing technique was developed in the Experimental factory and certain methods were devised for analysing plant performance and diagnosing operation troubles. Methods have been sought which will permit of such work being carried out in the factories without it being necessary to interrupt the normal sugar manufacturing process. The problems dealt with have covered all engineering aspects in the sugar factory and in particular those pertaining to steam conditions and milling performance. The characteristics of

Indian conditions have received special attention in these investigations and data have been collected which is proving useful in effecting improved efficiency on these plants.

(*b*) *Division of Sugar Technology*—

(*a*) Effect of dust seeding on the colours of Sugars.

(*b*) Comparative studies of the different methods of clarification adopted in the sulphitation plants in India.

(*c*) Phosphates and workability of juices.

(*d*) Buffer action in Cane Syrups.

(*e*) Keeping quality of *gurs*.

(*f*) Activated Carbons—Semi-large scale work on the methods evolved in the laboratory.

(*c*) *Division of Sugar Chemistry*—

(*a*) Clarification of Final Cane Molasses.

(*b*) The Sulphur dioxide content of consumption sugars of India.

(*c*) Deliming of clarified juices of the Sulphitation factories.

(*d*) Estimation of Caramel present in *Gur* and its relation to bitter taste.

(*e*) Preparation of Ultramarine Blue.

(*f*) Utilisation of Molasses—

(i) Recovery of Sugar,

(ii) Preparation of table syrup,

(*g*) Solubility of Sugars in alkaline and acid solutions.

(*h*) Solubility of Sugars in aqueous Salt solutions.

(*i*) Determination of moisture in *gur* and molasses.

(*j*) Comparative clarifying effeciencies of milk of lime and milk of lime sucrate.

(*k*) Preparation of compost from the waste products of the sugar industry.

(*d*) *Division of Physical Chemistry*—

(*a*) Clarification of cane juice by Sodium aluminate and electrical methods.

(*b*) Keeping quality of Indian sugars—Physico-Chemical studies.

(*c*) Ash contents of sugar products by the conductivity method—Indian Sugars.

(*d*) Activated carbon.

(*e*) "Neutral *Gur*" direct from cane juice.

(*f*) Deterioration of *gurs* on storage.

(*g*) Buffer action in clarified juices and syrups.

(*h*) Colour standardisation of Indian sugars.

(*i*) Removal of suspended impurities from syrups and molasses for re-boiling.

(*j*) Experiments on manufacture of sugar candy.

(*e*) *Division of Bio-chemistry*—

(*a*) Conversion of Cane Molasses into manure.

(*b*) Keeping quality of sugars.

(*c*) Molasses Road Composition.

(*d*) Manufacture of yeast.

(*e*) Manufacture of acetic acid, acetone and butyl alcohol from molasses.

Two complete large-scale effluent plants were set up at two sugar factories—one in Muzaffarnagar and the other in the Gorakhpur districts. Simultaneous analysis of untreated and treated effluent water was also arranged at the Provincial Govt.'s Hygiene Institute at Lucknow with a view to set up the standard for the treated effluent water.

(*f*) *Statistical section*—

(*a*) The distribution of grain size in the different Indian Sugar Standard grades of sugar.

(*b*) Expression for a capacity of a sugar factory in terms of size and number of rollers.

(*c*) Corelation between capacity and efficiency of Indian sugar factories.

(iii) *Sugar Research and Testing Station.*—During the year under report testing and research work continued as usual. Power driven crushers, bels, centrifugals, and other types of machinery and plant were tested.

Research work on hand at the Station included—

1. Experiments on scum washing.
2. Determination on the comparative efficiency of the various clarificants used in the open pan industry.
3. Manufacture of candy.
4. Keeping quality of *gur*.
5. Manufacture of Cream Jaggery.

Training of those engaged in the manufacture of sugar and *gur* by the indigenous methods, was begun during the year.

(iv) *Bureau of Sugar Standards.*—During the year under report the fifth Annual Meeting of the Advisory Committee of the Bureau of Sugar Standards was held on May 22, 1939. The 'Review of the quality of sugar manufactured in India by Central Sugar Factories and Refineries during the season 1938-39' after adoption by the above Committee was published in the Indian Trade Journal dated the 10th of August 1939, and reprints of the same were supplied to all concerned.

The Indian Sugar Standard Grades for the season 1939-40, as modified by the above Committee were prepared and issued as usual. A specification sheet giving the modified specifications was drawn up and circularised and supplied with each set sold. The decision of the Advisory Committee that no discount could be allowed on the sale of last year's sets was notified. The Government of India were moved in respect of the recommendation of the Advisory Committee for reduction of

prices of Standard Sets and sanctioning a scheme for research work as a preliminary to the grading of *Gur* and *Rab*. The various Sugar Associations were also addressed on the subject of stamping of I.S.S. numbers on sugar bags. The sale of fresh sets, empty bottles and renewal of old sets during the year was as follows—

Year.	New Sets.				Renewed Sets.				Bottles.	
	No. 1	No. 2	No. 3	No. 4	No. 1	No. 2	No. 3	No. 4	Std. Bottles.	Empty Bottles.
1938-39 . . .	34	1	2	...	50	4	1	3	28	1,329
1939-40 . . .	16	3	2	...	69	2	1	2	10	378

According to the decision of the Advisory Committee Sieve Analysis of a still larger number of samples of sugar with a view to fix the proportion by weight of sugar corresponding to different standard sieves for each grain standard number, was taken in hand and is still in progress. A large number of samples of sugar were obtained from sugar factories from their weekly productions for the above purpose.

Arrangements are now in hand for the preparation of standard grades for the next season, for compiling the Annual Review of quality for the season 1939-40 and for convening the sixth meeting of the Advisory Committee of the Bureau of Sugar Standards.

(v) *Cattle Feed Experiments.*—During the year under report only 'Bago-Molasses' containing two parts of molasses and one part of bagasse screenings was prepared as suggested in the Tenth Sugar Committee Meeting (1938). The best method for the preparation of 'bricks' of Bago-Molasses was investigated and the inclusion of finer screenings in the feed has given promising results with the advantage that the feed is better relished by the cattle.

Feeding trials with Bago-Molasses were carried out earlier at the several Animal Nutrition centres. The cost of production of Bago-Molasses, the comparative cost of control and experimental rations, and the amount of daily ration for animals in both the groups and the value of Bago-Molasses in terms of other feeds that it has replaced, have all been worked out, and in all the cases the cost of experimental rations has been considerably lower than the control rations. The results of the feeding trials with Bago-Molasses at four out of the five Animals Nutrition Centres have shown that this feed can form an economic substitute for part of ration of dairy stocks, working bullocks and growing heifers. It has also given an insight into the nature of the probable materials that may have to be mixed with Bago-Molasses for feeding various type of cattle. Further feeding trials were suspended as per decision of the Advisory Board Meeting of the Imperial Council of Agricultural Research and the work on further feeding trials is now to be taken up by the Imperial Veterinary Research Institute.

The preparation of standard feeds on the basis of data received from Animal Nutrition Centres, was attempted in accordance with the views expressed at the meeting of the Advisory Board of the Imperial Institute

of Sugar Technology (1939). On account of the relatively low amount of the molasses used in certain cases it was not found possible to incorporate therein all the ingredients to form a solid hard cake. One or two of them had to be left out from the cakes prepared, but they can be added prior to feeding cattle.

Allscott Cattle Nuts sent by the Imperial Council of Agricultural Research were analysed and it was found that these Nuts are similar to the feeds manufactured here except that the ash contents of the latter is a little higher. With the use of machinery, there will be no difficulty in preparing similar feeds.

The factors responsible for spontaneous combustion in the feed while being stored, are being studied. So far it has not been possible to ascertain the biochemical factors responsible for this phenomenon.

Sale of feed as also its publicity was pushed. A note for publicity on the work under the scheme till April 1939, has been issued to the press. The Assistant Registrar of Co-operative Societies, U. P., Lucknow, is co-operating in the purchase of the feed from the Institute for use in the Dairies under his control. Extension of the work of manufacturing Bago-Molasses at the outside sugar factories is being carried out and technical advice given to them as and when required.

Work is in progress on the design of suitable machinery for the manufacture of Bago-Molasses at the Experimental Sugar Factory.

(vi) *Statistical.*—The work primarily consists of—

(*a*) The collection and compilation of statistical returns under the Sugar Production Rules, 1935, and the preparation of statistical notes, statements and reviews for publication in the Indian Trade Journal on the basis of these returns.

(*b*) The management of the sugar trade information services.

(*c*) Statistical research and (*d*) Teaching.

In July 1939, all central sugar factories were informed that failure to submit returns under the Sugar Production Rules regularly and punctually would be an offence punishable under section 176 of the I. P. C. and that it was proposed to take action against defaulters in the season 1939-40. As a result the majority of sugar factories submitted returns in the prescribed forms and within the prescribed dates. It was, therefore, possible to present more complete figures in the various publications of the Institute for the season 1939-40, than for any previous season.

With the reduction of Indian imports of foreign sugar, the cabled reports on foreign sugar markets ceased to be of much value to traders in India. The Government, therefore, sanctioned the abolition of the Cable Service with effect from the 1st of April 1939. The remaining two services namely the Sugar Postal Service and the Indian Sugar Trade Information Service, however, continued as usual. Certain members of these services expressed a desire for market quotations of specified grades of sugar being wired to them which has been complied with.

(vii) *Training in Sugar Technology.*—In the year 1939-40, nineteen students as per details given below, completed their courses—

(*a*) Fellowship in Sugar Technology	3
(*b*) Sugar Boilers Certificate Course	3
(*c*) Chemical Control (Short term course)	1
(*d*) Pan-boiling Do.	6
(*e*) Fuel Economy and Boiler Control (Short term course)	1
(*f*) Statistics for sugar students Do.	3
(*g*) Statistics for research students Do.	2
Total	19

The number of students admitted to the different courses was as follows:—

(*a*) Fellowship course in Sugar Technology	4
(*b*) Associateship course in Sugar Engineering	2
(*c*) Associateship course in Sugar Technology	4
(*d*) Sugar Boilers certificate course	2
(*e*) Chemical Control (Short term course)	5
(*f*) Bacteriology Do.	1
(*g*) Pan-boiling Do.	6
(*h*) Fuel Economy and Boiler Control (Short term course)	1
(*i*) Statistics for sugar students Do.	3
(*j*) Statistics for research students Do.	2
Total	30

Out of thirty students admitted in 1939-40, twelve students were admitted from the U. P., four each from Bombay, Punjab, Bengal, and the Indian States and one each from Madras and North West Frontier Province.

(viii) *Employment Bureau.*—The work of the Bureau continued to be satisfactory and a number of technically qualified persons who got themselves enrolled in the Bureau secured employment in sugar factories. In some cases the number of requisitions from the factories was more than the number of the particular type of technical hands available on the register of the Bureau.

(ix) *Publications and Library.*—Notes and consolidated statements giving detailed statistical information published in the Indian Trade Journal were 85 in number. Books and publications added to the Library during the year under report numbered 252.

Section III—Animal Husbandry.

CHAPTER I.

GENERAL IMPROVEMENT OF CATTLE IN INDIA.

An account of the measures initiated as a result of H. E. the Viceroy's cattle improvement drive was given in an earlier report. In the last year's report, it was further mentioned that the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry reviewed the position at their meeting held in February 1939. In order to ascertain the exact position about the total number of bulls available for service and the amount of donations received, the Provincial Governments were addressed. A summary of the position on 31st March 1939 as disclosed in their replies shows that H. E. the Viceroy's appeal has added as many as 2,815 bulls to the number normally present in the various Provinces for stud purposes. There was also on the date mentioned above, an unspent balance of Rs. 1·3 lakhs out of the cash donations available for the purchase or maintenance of stud bulls.

A correct appreciation of the improvement that has taken place in regard to the distribution of bulls as a result of H. E. the Viceroy's appeal can be had by comparing the position in 1935-36 when the appeal was made with that on the 31st March 1939. The number of bulls at stud in 1935-36 was only a little over 10,000 in India which works out only to one per cent. of her requirements. As a result of the appeal however, there has been an increase of 12 to 15 per cent. in the United Provinces and the Punjab where the position in 1935-36 was already strong. The percentage of increase in the case of the Central Provinces and Berar is 25 per cent. In other provinces also the number of stud bulls shows a marked increase. Stud bulls in British India as a whole show an increase of 28 per cent. Further improvement in this respect may be expected with the growth of Breed Societies and Cattle Improvement Associations which are rapidly coming into existence. Technical assistance required in this connection is being provided by the Council.

Export Trade.

The export of Indian cattle to some of the tropical countries, *e.g.*, Ceylon, Straits Settlements and Federated Malaya States is rapidly falling. The main cause of the decline of this important export trade of India lies in the lack of information abroad with regard to the qualities of both milch and draught breeds of India. Besides, in the absence of foreign markets where higher prices for pedigree stock can evidently be expected than those in India, the breeders themselves have no incentive for improving their stock. In view of these considerations certain preliminary steps for advertising Indian cattle abroad and copies of a few Bulletins issued on the brief survey of some of the important breeds of cattle in India (Misc. Bull. Nos. 17 and 24) and on the definition of the characteristics of the seven breeds of cattle of all-India importance (Misc. Bull. No. 27) which contain photographs and descriptions of Indian cattle were furnished to the Indian Trade Commissioner, London, and to the Veterinary Departments of Brazil, Argentine, Trinidad, West Indies, East African Protectorates, Iraq, Ceylon, Malay States, French Indo-China, Java, Formosa, Phillipines and Egypt. Copies were also supplied to the Indian Trade Commissioner, London, for distribution to the Colonial

Governments. In addition, copies of the Bulletins were furnished to the other Indian Government Trade Commissioners at New York, Alexandria, Osaka and Mombasa. As a result of this step inquiries were received from Kenya, Malay States, Basutoland, Nairobi and Morocco during the year under review and two Sahiwal bulls were supplied to Kenya and an order for a further supply of four Sahiwal and four Kankrej bulls was received.

It is hoped that such wide advertisement along with the introduction in this country of general pedigree registration, milk recording and satisfactory arrangements for quarantine at ports and for the certification of livestock will stimulate the development of this important export trade and simultaneously provide the much desired impetus to the cattle industry in India. Necessary steps in this connection are being taken by the Council as also for the further development of the considerable export trade in animal products. Further, in order to encourage the export trade in cattle, the Council have decided to publish some more literature on the subject.

CHAPTER II.

(i) *Visits of the Animal Husbandry Commissioner to Provinces and States.*—The Animal Husbandry Commissioner with the Government of India visited Madras, Central Provinces and Berar, Jodhpur, Bhopal and Mysore during the year under review and advised the Governments in respect of the improvement of Animal Husbandry and the future policy in these provinces and states.

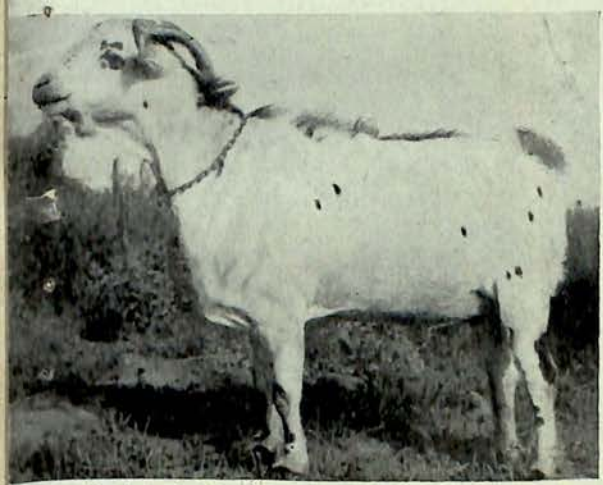
(ii) *International Veterinary Congress, Zurich and Interlaken, 1938.*—The proposal for India's participation in the thirteenth International Veterinary Congress, Zurich and Interlaken, 1938, was considered and approved by the Advisory Board and the Governing Body at their meetings held in November and December 1937, respectively. The delegation constituted for this purpose consisted of Col. Sir Arthur Olver, Messrs. P. J. Kerr, J. H. G. Jerrom and Capt. S. C. A. Datta. An exhaustive report on the proceedings of the Congress in so far as these have a bearing on India, has since been submitted by Col. Sir Arthur Olver, the senior delegate to the Congress. The report is now under the consideration of the Council. On their way to the International Veterinary Congress, the delegation also attended the first Imperial Veterinary Conference, held in London, in August, 1938. The report issued by the Imperial Bureau of Animal Health on the proceedings of the Conference has also been received and is being considered by the Council.

(iii) *Meetings of Standing and* ad hoc *Committees on the Animal Husbandry side.*—The following Standing and *ad hoc* Committees met during the year under review:—

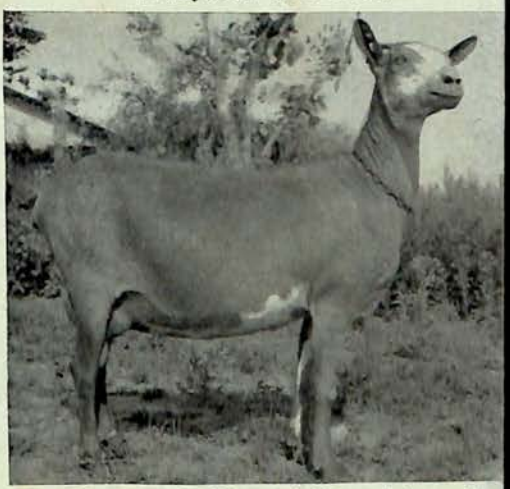
(1) *Ad hoc* Animal Breeding Committee.
(2) *Ad hoc* Animal Disease and Pests Committee.
(3) *Ad hoc* Animal Husbandry Committee.
(4) Standing Animal Nutrition Committee.
(5) Standing Dairying Committee.

Jamna Pari female No. 292, No. of days in milk : 301 ; Average milk yield : 2 lb. 9 oz.

Jamna Pari male No. 258. The dam was in milk for 176 days; average milk yield : 3 lb. 11 oz.

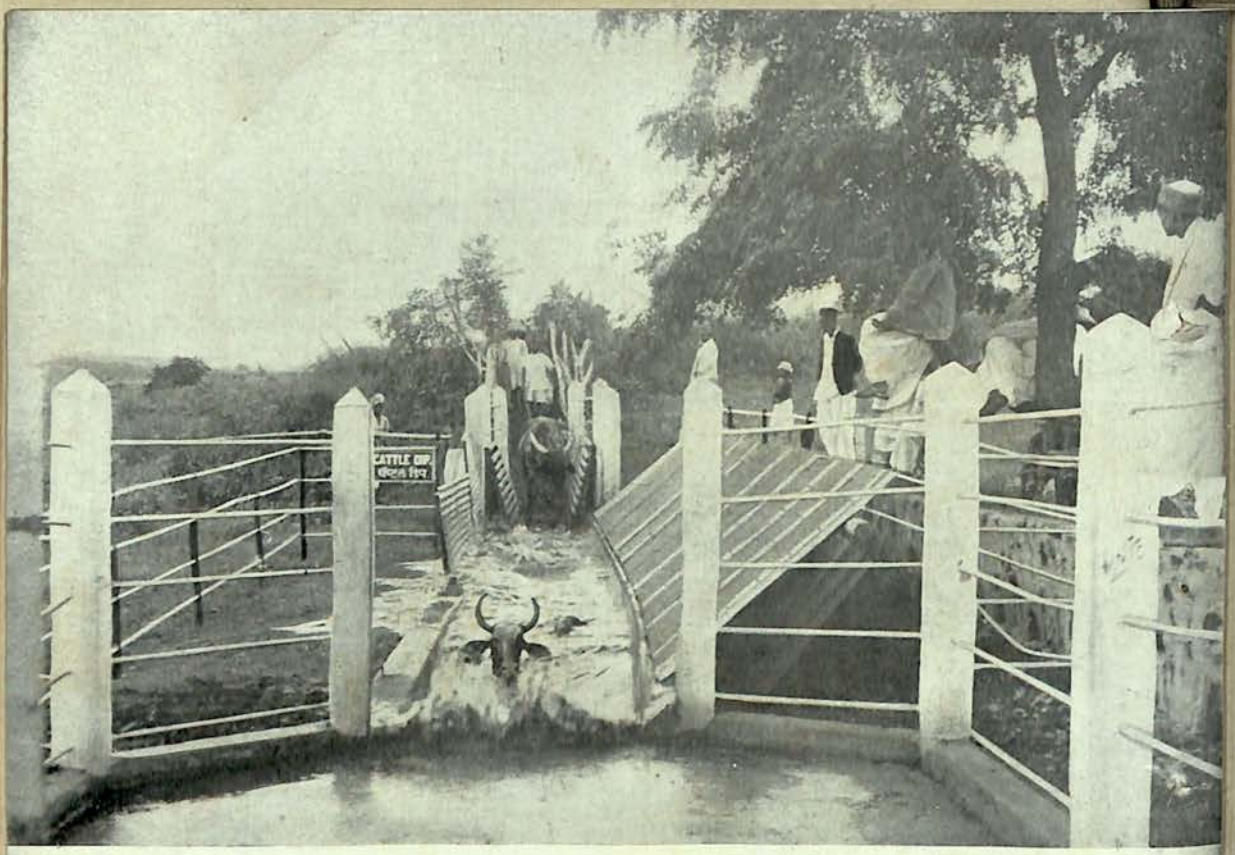


Bar-Bari male No. 389. The dam was in milk for 188 days, average milk yield : 2 lb. 14 oz.

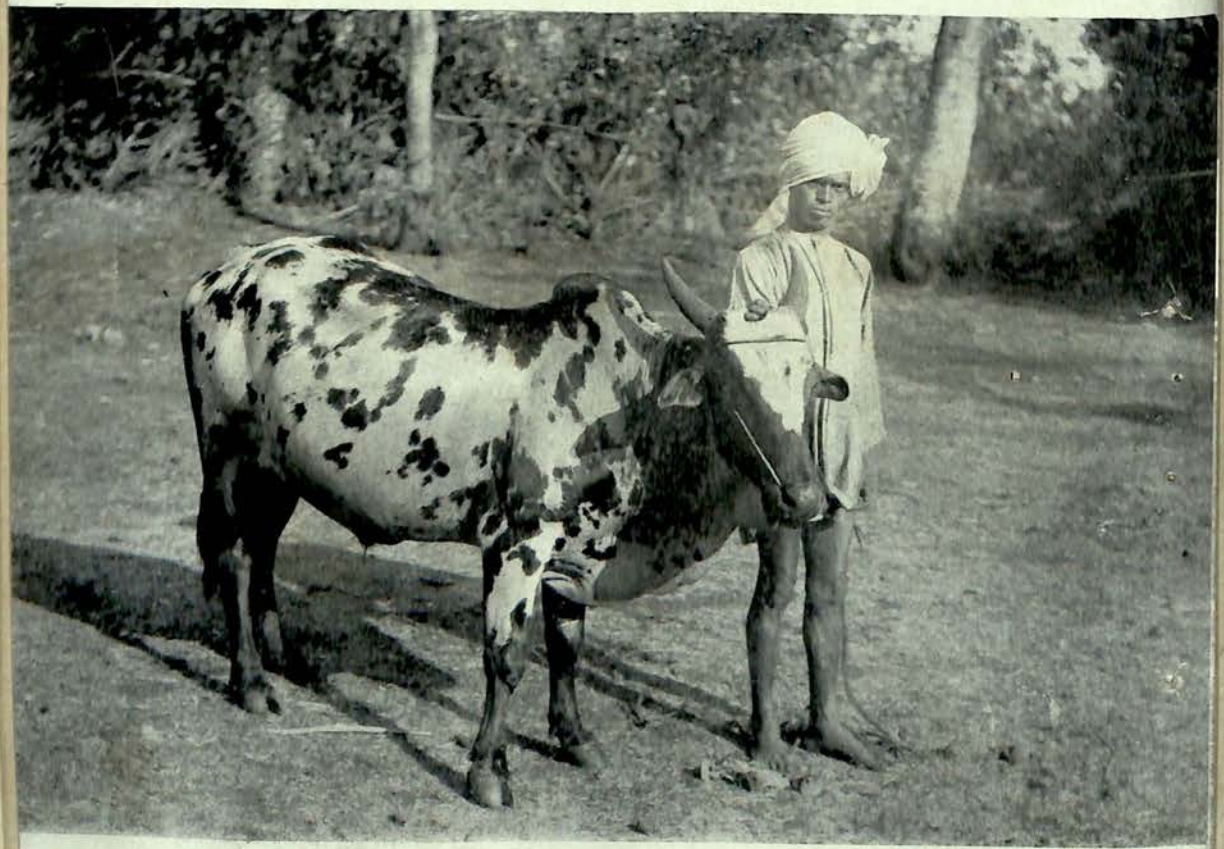


Bar-Bari female No. 449, No. of days in milk: 317; average milk yield: 2 lb. 3 oz.

PLATE III] Ophthalmia in calves



Cattle dipping tank



[PLATE IV]

Bullock, 6 years, dipped fortnightly in the cattle dipping tank

CHAPTER III.

ANIMAL DISEASES.

Veterinary Investigation Officers' Scheme.

The object of the scheme for the appointment of Veterinary Investigation Officers in the provinces and Hyderabad State has been stated in previous reports. These officers work in close collaboration with the Imperial Veterinary Research, Muktesar, and carry out comprehensive survey of disease conditions in the field and supply requisite material and information for detailed research. Their report for 1938-39 shows that during this period some of the major diseases investigated were:—

Bovine tuberculosis, Anthrax, Johne's disease, Bovine abortion, Streptococcal mastitis in cows, Protozoan disease in cattle, parasitic gastritis, nasal granuloma, foot and mouth disease, Doyle's disease in poultry, coccidiosis, piroplasmosis, contagious caprine pleuro-pneumonia, and pasteurellosis. A brief *résume* of the major items of investigation by each officer is given below:

Central Provinces.—Two outbreaks of bovine trypanosomiasis commonly known as *surra* which were responsible for a heavy mortality in cattle were investigated. Further investigation into coccidiosis in cattle and the treatment and control measures against this pest were carried out. A number of cases of bovine tuberculosis, haemorrhagic septicaemia, and octorrhoea in buffaloes came under investigation. The common diseases noticed in calves during the period were mange, ringworm and white scour. outbreaks of fowl cholera, Ranikhet disease, coccidiosis and fowl pox were also dealt with. Rhenosporidiosis, a disease of the nasal tract was detected for the first time in equines in this province. This infection is communicable to human beings and is very troublesome.

Punjab.—The work carried out during the year included (1) determination of the incidence of tuberculosis in various herds of cattle, (2) investigation into the incidence and control of goat and sheep diseases, (3) coccidiosis in cattle, (4) stomach worm diseases, (5) enzootic haematuria, (6) plant poisoning, (7) fowl diseases, and (8) deficiency diseases. In addition, miscellaneous problems, such as causes of sterility in cattle, helminth infection and osteomalacia were also investigated.

United Provinces.—Experimental determination of the minimum amount of ordinary anti-rinderpest serum required for checking the severe reaction produced in buffaloes by goat virus method of vaccination against rinderpest were carried out. This work will considerably reduce the cost of vaccination. Certain obscure diseases of cattle were studied and the material from the cases was sent to the Imperial Veterinary Research Institute for further detailed research. In addition, anthrax, sterility in cows, parasitic infections in cattle, sheep-pox, contagious abortion in goats and certain fowl diseases were investigated.

Orissa.—Tuberculosis, poultry diseases and deficiency diseases were studied during the year. A number of positive cases of tuberculosis in cattle were detected.

Bihar.—The diseases investigated during the year were rinderpest, enzootic otorrhoea, horn cancer, fowl diseases, and equine encephalomyelitis.

From the results of the experimental work on goat-tissue virus method of vaccination against rinderpest, it appeared that reduction in the dose of vaccine had no effect on the intensity of reaction. Cases of bovine contagious abortion, Johne's disease and actinomycosis were also encountered. It is stated that out-breaks of Doyle's disease and fowl pox were responsible for heavy mortality in poultry.

Assam.—Bovine tuberculosis, contagious pleuro-pneumonia, abortion, coccidiosis and cases of grass poisoning were dealt with during the year. These were examined, and suitably controlled. Ranikhet disease and avitaminosis were among the fowl diseases investigated.

N.-W. F. P.—Experimental work on the immunisation of hill cattle against rinderpest was carried out in Kurram Agency. A severe outbreak of bovine surra in Kurram was successfully controlled. Further work on sheep-pox immunisation was continued. Treatment of liver fluke in cattle and sheep with carbon tetrachloride was carried out with very encouraging results.

Sind and Ajmer-Merwara.—There was an outbreak of rinderpest among sheep and goats in Kekri, and the mortality in affected cases was 80—90 per cent. Ordinary anti-rinderpest serum when used alone, did not yield satisfactory result. As an experimental measure goat tissue vaccine was administered along with simultaneous varying doses of anti-rinderpest serum. The results are stated to have been very encouraging and further work is in progress. Certain other obscure diseases occurring among goats were also investigated and the material sent to the Imperial Veterinary Research Institute for further research. Investigation was continued into the incidence and geographical distribution of the warble fly, a serious pest in cattle which is responsible for considerable depreciation in the value of hides and skins.

Madras.—Contagious caprine pleuro-pneumonia, anthrax, pox, circling disease in sheep, rinderpest, parasitic infection and foot and mouth disease were among the diseases investigated during the year. Severe outbreaks of anthrax in sheep and goats were investigated and experimental work was carried out in respect of suitable control measures.

Bombay.—Intensive investigation was undertaken in respect of the determination of the incidence of tuberculosis, Johne's disease and contagious bovine abortion and their widespread prevalence was revealed. Other conditions investigated during the year under review were Mastitis Nasal Granuloma, Goat Pox Pasteorellosis in sheep and goats, and a number of poultry diseases.

Work in connection with the 'Tick control scheme' which is of tremendous economic importance progressed satisfactorily.

Bengal.—Biological tests were carried out extensively for detecting the incidence of Tuberculosis, Johne's disease and contagious bovine abortion. Appreciable number of cases of each of these infections was recorded. The other major diseases studied were Bovine lymphangitis, hump sore, Piroplasmosis in cattle, Nasal granuloma and Rabies. Parasitic infections of livestock were also investigated and it is stated that a form of parasitic pneumonia in goats was responsible for heavy losses in some parts of the province.

Hyderabad.—Control of rinderpest with goat vaccine was continued with very satisfactory results. An outbreak of surra was successfully controlled by treatment of affected cases with *Naganol* and adoption of

measures against the biting flies which are responsible for the spread of the infection. These operations saved a valuable stock of 200 horses. Outbreaks of bovine surra were also investigated and controlled and a case of surra in a dog was confirmed. Tests for the detection of tuberculosis and Johne's disease were undertaken. The measures adopted against liver fluke during the previous year are stated to have yielded encouraging results. The mortality due to this serious insidious infection has been considerably reduced.

Osteomalacia—a bone disease and parasitic infection in livestock were also extensively investigated during the period under review.

The various reports were considered by the Advisory Board at their meeting held in December 1939 and it was considered that valuable results had been obtained. The tests for tuberculosis in buffaloes carried out in Bombay had shown the remarkable efficacy of the biological product 'tuberculin', prepared at the Imperial Veterinary Research Institute, Mukteswar. The number of isolated cases of Johne's disease detected during recent years and the confirmation of the many outbreaks of rinderpest in sheep and goats indicated that these infections were much more widely prevalent than was hitherto realised. It was noted that several provinces were manufacturing goat-rinderpest-vaccine at their headquarters laboratories and it was considered very necessary that the virus should be periodically tested at Mukteswar with a view to eliminating the possibility of its being supplied for field work in an inert state. In regard to the condition affecting sheep and goats, known locally in Sind as *Pitto* and in the Punjab as *Gillar*, which has been under investigation for many years past, it was agreed that a concentrated effort should be made in collaboration with the Mukteswar Institute to determine its etiology, *i.e.*, the causative agent of this disease. Regarding the disposal of positive cases of tuberculosis and Johne's Disease, it was felt that in view of the wide-spread incidence of these infections the attention of the public should be drawn to the danger to the other animals and in the case of tuberculosis to human beings also, as segregation alone was not a satisfactory way of disposing of these cases.

In the last year's report, it was mentioned that the Governing Body had sanctioned the continuance of this disease investigation scheme for one more year, that is, up to 31st March 1940. The Advisory Board, at their meeting held in May, 1939, considered the question of further continuance of the Veterinary Investigation Officers' scheme. The Board were of the opinion that the scheme had already yielded very valuable results and was one of the most important and outstanding in the list of the animal husbandry schemes financed by the Council. They, therefore, recommended that—

1. The scheme should be extended for a period of five years or until such time as the Government of India could take over the staff.

2. The scheme should continue on the same terms as for the present extension upto 1940, *i.e.*, the Council should bear the full cost of the pay and travelling allowance of the Veterinary Investigation Officers and the provincial Governments should provide the clerk, peon and contingencies.

The extension of these posts was accordingly recommended at a cost of Rs. 5,00,000 to the Council for a period of 5 years. The Governing

Body at their meeting held in July 1939, sanctioned the extension of the scheme for a year more, in the first instance, *i.e.*, upto the 31st March 1941.

Mysore Johne's Disease Investigation scheme.—The scheme was started in July 1935 for a period of three years and was granted an extension of 2 years on its termination in July, 1938. During 1938-39, an epizootological survey was undertaken to assess the incidence of the disease in Mysore and Bangalore, and a number of suspected cases from the Imperial Dairy Farm and the Hosur Cattle Farm revealed that most of them were infected. The routine bacteriological and pathological work was continued and a technique for staining sections for biological study was worked out. Johnin, the biological product employed in the detection of positive cases of this infection, was prepared in the laboratory and tested. Apart from being utilised in this scheme it was also distributed to the Director of Veterinary Department, Assam, the Hosur Cattle Farm and the Coimbatore Agricultural Farm. Experiments were carried out with small laboratory animals, which were successfully infected with the disease material obtained from the farm cattle. This is one of the notable advances made in this investigation, for instead of carrying out the work on cattle it is now possible to prosecute further experimental work on the small laboratory, animals. Experimental treatment of affected cases with *oleum-hydrocarpi i.e., Chaulmoogra oil* was continued. This line of investigation has been undertaken because the organism responsible for Johne's disease resembles the leprosy organism. A preliminary study of the chemical composition of Johne's disease bacillus was undertaken in collaboration with the workers at the Indian Institute of Science, Bangalore, and interesting results were obtained. The Advisory Board considered the report in December 1939, and observed that the study of the chemistry of the bacillus of Johne's disease was a problem for fundamental research and should be investigated at the Central Institute. It was also observed that the results of treatment with *Chaulmoogra* oil had not so far yielded any definite results. The question of further extension of the scheme and the correlation of the work thereunder with the proposed similar but detailed investigation at Mukteswar, for which an officer is being specially trained in the United Kingdom, is under the consideration of the Council.

Scheme for Control of Ticks, Bombay.

Work on this scheme was initiated in January 1939, and during the year dipping operations were conducted at Devgin (Dharwar), Tandulwadi (Satara), Benkathi (Bijapur), Turkewadi (Belgaum) and Kaji Sangir (Nasik). Two large spraying machines were obtained from England and cattle and buffaloes have been subjected to the spraying treatment without any untoward accidents. It was found necessary to keep the cattle for at least half a minute under the machine, to ensure complete soaking. In addition to ticks certain other parasites and diseases of the skin and eye, *viz.*, lice, flea, mange and parasitic diseases were also controlled by the spraying operations.

Experience of the initial work has demonstrated that spraying machines were not readily portable and that the cost of the machines was high. This method is therefore not likely to prove economical and the Advisory Board of the Council have observed that the use of tanks for these dipping operations would be more satisfactory under conditions obtaining in India.

Warble flies Scheme, Mukteswar.—During September and October of 1938, a survey of the Kashmir valley was undertaken, and it was found that 'kaugani' goats were heavily infested with *H. crossi*. Except for sporadic cases reported in the Nilgiris, the warble fly appeared to be entirely unknown in South India. A map showing the regional distribution of *H. crossi* and *H. lineatum* in the N.-W. F. P. has been prepared. Observations on the life history and bionomics of the two species were also carried out. The regional distribution of *Hypoderma lineatum* is now fairly well known and a method has been evolved by which these flies could be reared under artificial conditions. The life history of this fly, excluding information regarding the period of incubation of the eggs, has been prepared. An extremely important point which does not conform to the findings in other countries was that oesophageal larval forms did not appear to be migrating to the back of the host. It appears that the route taken by these larvae to their final destination must be different. Valuable work has been done in regard to these cattle pests, but much remains to be done in connection with the goat warble fly.

The scheme for extending the warble fly scheme at Mukteswar in a modified form so as also to deal with research into the damage caused by ticks to hides and skins was considered and approved by the Advisory Board at their meeting held in December 1939. The matter awaits consideration of the Governing Body.

SCHEME FOR THE APPOINTMENT OF A SYSTEMATIC PROTOZOOLOGIST AT MUKTESWAR

During the year under review further observations were made on the morphology of the virulent form of theileria parasite (*T. annulata*). In this connection it is noteworthy that in February 1939, a consignment of blood and organ smears from a natural case of theileriasis was received from the Hyderabad State for examination and it was found that the invasion of red blood corpuscles was of the same degree as noticed at Mukteswar. Towards the end of the year the experimental treatment of theileriasis with members of the sulphanilamide group of drugs was undertaken.

Observations were also made on the behaviour *in vitro* of surra trypanosome of equine and bovine origin. Very interesting results have been obtained and the experiments are being continued. Further observations were made of Toxoplasma in dogs, *Encephalitozoon cuniculi*. *Babesia foliata* a new species recorded in sheep, *Entomoeba bovis*, and *Eimeria tenella* in poultry.

The question of the extension of this scheme is under the consideration of the Council.

INVESTIGATION OF TUBERCULOSIS AND JOHNE'S DISEASE AMONG ANIMALS AT THE IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESWAR.

Mr. Lakshmi Sahai, the Research Officer under the scheme, is receiving training in the United Kingdom. It is expected that work under this scheme will be started at Mukteswar early next year.

SCHEME FOR INVESTIGATION INTO THE CONTAGIOUS ABORTION OF CATTLE GOATS AND SHEEP AT THE IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESWAR.

Mr. J. B. Polding, B.Sc., M.R.C.V.S., the Research Officer under the scheme, joined duty in May 1939. The technical programme of the

scheme was considered and approved by the Advisory Board of the Council in December 1939. It may be noted that the primary object of the scheme is to estimate the incidence of abortion in animals in India, and from this to judge whether control measures are economically warranted and feasible and, if so, the formulation of detailed plans in respect of these measures. For this purpose an initial field survey is the first step in the programme of investigation and this is now in progress.

Scheme for enquiry into the indigenous systems of veterinary medicine

In pursuance of the decision of the Governing Body of the Council that an enquiry into the efficacy or otherwise of the indigenous systems of treatment of cattle in India should be undertaken, this scheme was sanctioned and Mr. A. Krishnaswamy of the Civil Veterinary Department, Madras, was appointed as the Research Officer thereunder in May, 1939. He was entrusted with the work of (i) collection and collation of all available useful information from manuscripts and other sources regarding indigenous systems of treatment in Orissa and Travancore and (2) the preparation of a report incorporating all the material resulting from this investigation. This officer carried out investigations in the Travancore and Cochin States and in the Provinces of Madras, Orissa and Bengal. He has submitted a report containing information regarding the indigenous veterinary systems and has *inter alia* observed that rural veterinary Vaidyas (doctors) still practise empirical treatment in most of the villages in India. Further the report states that many of the most valuable original works on indigenous veterinary medicine appear to have been lost, probably due to want of proper care in their preservation. The few that have survived the ravages of time are lying neglected and unknown to the profession, evidently due to lack of sufficient number of pioneer workers in this field. This report, read with an article entitled 'A Short History of Ayurvedic Veterinary Literature' by Mrs. Shirlaw, published in the March 1940 number of the Indian Journal of Veterinary Science and Animal Husbandry, constitutes a very interesting record. The report shows that there are a large number of village cow doctors practising in this country, but their system of treatment is not based on the information available in the manuscripts. The officer has recommended that the field to be traversed is vast and the enquiry so far conducted, has only served to show that a great deal of further investigation on proper and well-organised lines is essential, if final conclusions are to be arrived in regard to the efficacy, or otherwise, of the indigenous drugs and their wider use by the veterinary profession. The report and the recommendations are under the consideration of the Council.

Madras Scheme for research into the indigenous drugs of India with special reference to their toxicology

This scheme provides for (i) A scientific study of indigenous drugs of reputed efficacy and poisonous plants and in the case of those likey to prove of therapeutic use in veterinary practice, assessing their value and standardising the dose for large animals, and (ii) Examination of the pharmacological drugs and their allied species growing in India which are used in veterinary practice, in order to ascertain the possibility of employing them in place of imported drugs. The work will be carried out in collaboration with the Civil Veterinary Department, Madras, and

Col. R. N. Chopra of the School of Tropical Medicines, Calcutta. The detailed technical programme of the scheme was considered and approved by the Advisory Board at their meeting held in May 1939. While approving the programme, the Board recommended that Provinces, other than Madras, should also be requested to send material for examination by the officer employed under this scheme and that every endeavour should be made to carry out the preliminary enquiries on such of those indigenous drugs as have been tried by qualified veterinarians and found to be really effective in the treatment of cattle diseases. The recommendations of the Board have been communicated to the Provincial Governments concerned for necessary action. The Government of Madras are recruiting the staff required for the scheme which is expected to start shortly.

Helminthological Schemes

In August 1933, the Advisory Board recommended the establishment of four centres at Lucknow, Nagpur, Madras and the Imperial Veterinary Research Institute, Mukteswar, for the purpose of investigation and research on problems relating to veterinary helminthology. Some specific research problems are being worked out at the Lucknow University under the supervision of Dr. G. S. Thapar. A similar scheme was sanctioned and started in Madras, with effect from June 1939. Dr. Moghe of the Nagpur University submitted a scheme for the Nagpur centre and this relates to intensive survey of helminth parasites. Financial sanction for this scheme was accorded during the year. As regards the Imperial Veterinary Research Institute, Mukteswar, a scheme complementary to that at Lucknow and Madras has been submitted by the Director of the Institute. This was approved by the Advisory Board with certain modification and now awaits consideration of the Governing Body.

The Helminthological Committee also recommended that an extensive survey regarding the incidence of helminthic infection should be undertaken by each of the four centres in their respective jurisdiction. The Committee further observed that the staff sanctioned in connection with the scheme at the four centres would not be able to carry out the research work as well as the general survey and identification of the mass of material that they would receive. The authorities at the Madras centre, however, felt that facilities already existed at Madras for carrying out the proposed survey and that, for the time being, extra staff was not necessary. The Advisory Board, therefore, recommended that an additional research assistant should be sanctioned for the remaining three centres with a view to expediting the intensive survey work in regard to the incidence of helminthic infection. The Governing Body approved this recommendation and necessary funds for the purpose have since been allotted.

Poultry Disease Investigation Scheme

At their meeting held in November 1937, the Advisory Board emphasised the fact that under the present circumstances in India, research into the diseases of poultry was more important than work on poultry breeding. They also observed that in order to take full advantage of the specialist officer for research on poultry diseases at Izatnagar, and in view of the fact that it was not possible for the existing Veterinary Investigation Officers in the provinces to undertake this work in addition to their already heavy duties, an additional investigation officer was needed in each province and constituent State for research work into the diseases of poultry.

Pursuant to this recommendation the provinces and States were consulted as to the facilities they could provide for the purpose and were invited to submit schemes on the basis of contribution by them of half the estimated cost. In response to this, schemes were received from Madras, Bombay, United Provinces, N.-W. F. P., Bihar, Orissa and Baroda. The Orissa Scheme was subsequently withdrawn by the Provincial Government and the remaining schemes, with the exception of the Baroda scheme, were approved by the Advisory Board. A uniform scheme and detailed programme of investigation was prepared by the board and recommended for adoption in each of these provinces. The Baroda scheme was referred back for clarification of the point as to what degree of collaboration with the Veterinary Investigation Officer, Bombay, was required and whether Bombay had agreed to such collaboration. The Advisory Board had also approved earlier a scheme for investigation of poultry diseases in the Mysore State. All the schemes approved by the Advisory Board were considered and approved by the Governing Body at their meeting held in July 1939, and the necessary funds were allotted during the year under review. Some more schemes have since been received from the rest of the provinces and constituent States and are under the consideration of the Council.

SCHEME FOR RESEARCH INTO THE DISEASES OF POULTRY AT IZATNAGAR.

This scheme was submitted by the Government of Bengal, but as its entire administration is to be supervised by the Imperial Veterinary Research Institute, it is being treated as a Mukteswar scheme. The Governing Body approved it in 1933. The original idea was to appoint a fully qualified Indian to take charge of the scheme, but as no suitable candidate was available, it was decided to depute a suitable officer for training in the United Kingdom. Mr. S. Ganpathy Iyer, Assistant Veterinary Research Officer, Imperial Veterinary Research Institute, Mukteswar, was selected by the Federal Public Service Commission for this purpose and is now undergoing training in the United Kingdom for a period of two years. He proceeded for training early in 1939.

CHAPTER IV

ANIMAL BREEDING

(i) *Cattle Breeding*

A SCHEME FROM THE GOVERNMENT OF THE PUNJAB TO SUPPLEMENT LIVESTOCK INVESTIGATION WORK AT THE GOVERNMENT CATTLE FARM, HISSAR

In order to take full advantage of the facilities and material available at the Government cattle farm, Hissar in the Punjab, the Council decided to supplement the work which is already in progress there. Consequent to this decision the Provincial Government submitted a scheme which was approved by the Advisory Board with certain modifications in respect of the details of work and the cost. The objects of the scheme are:

(*a*) To ascertain the practicability of introducing progeny tests as a means of assessing the value of stud bulls in India.

(*b*) To demonstrate the possibilities of segregating out, from an existing Indian breed, the Hissar breed on the Hissar Cattle Farm, definite strains which can be relied upon to breed, true for high milk yield, and to determine what effect, if any, this has on the inheritance of work characteristics.

(*c*) To study the inheritance of purely work characteristics and compare the results obtained with a similar study in the Dairy herd.

(*d*) To study the effects of weaning calves under approximate village conditions—

(i) to compare the rates of growth and weights of weaned and unweaned calves,

(ii) to compare the production of milk and butter fat of weaned and unweaned cows, and to evolve a correction factor for purposes of estimating the milking capacity of unweaned herds.

(*e*) To study the comparative growth and developments of calves of milk and working types.

(*f*) To determine the optimum calving interval and dry period for cows of this breed.

(*g*) To carry out such minor investigations as may be decided upon in consultation with the Animal Husbandry Commissioner with the Government of India.

Research into the possibility of improving the Himalayan Hill Cattle

The condition of the hill cattle of the Himalayan Range which are weak in stamina and poor milk yielders was referred to in a scheme submitted by the Government of the United Provinces. It was stated that these cattle subsisted on the sparse and poor quality of grazing available in this region and that their value as draft cattle was very low. The Provincial Government urged the necessity for conducting practical research into the problems of improving hill cattle both for milk and draft purposes.

The main lines of work envisaged in this scheme were (1) the selection of pure types suitable for different altitudes in the mountains, (2) careful breeding and selection in order to build up local herds suited to particular local conditions and (3) the study of indigenous fodders and grasses and introduction of promising strains to supplement the natural grazing in the hills with a view to improving the quality. The scheme was considered by the Advisory Board at their meeting held in November 1939 and it was observed that facilities for carrying out the preliminary work on all aspects of the problem, including the work suggested to be done at altitudes over 5,000 feet, existed at the Imperial Veterinary Research Institute, Mukteswar. As regards the work relating to lower latitudes, the Board recommended that the Provincial Government may submit a revised scheme in consultation with the Director, Imperial Veterinary Research Institute, Mukteswar. The Provincial Government were accordingly addressed on the subject and asked to mention in the revised scheme, the approximate cattle population in the areas concerned and other relevant details.

Indigenous breeds of horses and ponies

A note on the indigenous breeds of horses in India was discussed at the last meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India, held in February 1939. The Board recommended that the provinces and States concerned should be

addressed again for the supply of more detailed information in respect of the breed or breeds of horses found within their jurisdictions. The question should then be rediscussed at a future meeting of the Wing with a view to formulate proposals for plans of improvement. The Council accordingly requested all the Provinces and States with a horse population of 20,000 or more, to furnish detailed notes on the indigenous breeds found in their respective territories. Their replies are being received and will be placed before the next meeting of the Animal Husbandry Wing.

Pig rearing

While, with few exceptions, no effort has so far been made in India to develop this industry on well organised lines, pig rearing is an important industry in foreign countries followed either exclusively or as a side-line to agriculture. The inquiries received by the Council during the year under review, however, reveal that the importance of this industry is now being gradually recognised in this country. As a first step in that direction an article on 'Rearing of Imported Pigs' by Mr. E. M. Bee, was published in "Agriculture and Livestock in India". Another article on the subject entitled 'Essentials of Pig feeding' was written by Mr. H. B. Shahi, Assistant Animal Husbandry Expert of the Council for publication in 'Indian Farming', the monthly magazine of the Council.

Scheme for the improvement of the Kangayam breed of cattle

There is a possibility of improving the milking capacity of the Kangayam cows, as the results at Hosur have indicated that their yields can be raised from an average of 1,500 lbs. to 2,500 lbs. in a lactation. If similar results could be obtained in the Kangayam breed in general without impairing the draught quality, a valuable supply of milk would be made available over a large area of Southern India. With this purpose in view, the Pattagar of Palayakottai has submitted a scheme, which, with certain modifications, was accepted by the Advisory Board in December 1939. The scheme is due to be considered by the Governing Body.

Pedigree Registration and Establishment of Herd Books

Detailed mention has been made of the Council's activities in this direction in the previous report. The Punjab Government scheme for starting Herd Books and Pedigree Registration of the Hariana breed of cattle has since been sanctioned. The report of the new conveners on the breed characteristics of the 'Tharparkar' breed has been received and is under the consideration of the Council.

It was originally decided to open herd books for all the 8 milch breeds of all-India importance. To begin with, however, it is proposed at this stage to take up the registration work in respect of three breeds only. The steps necessary for initiation and maintenance of these books were considered by the Advisory Board at their meeting held in December 1939. Rules and regulations to be observed in this connection were also considered and the Board recommended that they should be circulated to provinces and States for their comments and modifications, if necessary. Further necessary action in the matter is being taken.

The Council has sanctioned the necessary funds for the work in connection with the definition of breed characteristics of Khillari, Dhanni and Malvi breeds of cattle and Surti, Nili and Ravi breeds of buffaloes.

The Hyderabad Government have generously volunteered to carry out the work in connection with the Deoni breed at their own cost. Reports from the various conveners of the above breeds are awaited. A Miscellaneous Bulletin of the Council dealing with these breeds will be published in due course as in the case of eight more important milch breeds.

A large number of grey cattle exhibited under breed names remain to be classified on the basis of definite breed characteristics. The Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry which considered this matter at their meeting held in February 1939 recommended that the Imperial Council of Agricultural Research be asked to devise means for defining the breed characteristics of these breeds. In pursuance of this recommendation the Animal Husbandry Commissioner with the Government of India prepared a scheme which was considered and approved with some modifications by the Advisory Board at their meeting held in May 1939. It is proposed that two officers selected by the Imperial Council of Agricultural Research be appointed for a period of nine months to define the breed characteristics of Gaolao, Mewati, Rath, Nagori, Hissar-Hansi, Hariana, Bhagnari and Dajal breeds of cattle.

Breeds Societies

If herd books and registration of Indian breeds of cattle are to be made a success, it is essential that breed societies should be formed to work in the interests of breeds. A Breed Society for the Sahiwal breed of cattle has since been formed. It is anticipated that a large number of societies for other breeds will also be formed gradually in various parts of the country. Steps are being taken by the Council to frame a uniform set of rules and bye-laws for these societies for the guidance of Provincial Governments and States.

(ii) Sheep and Goat breeding

Production of Karakul pelts

A scheme for sheep breeding in the N.-W. F. P. for production of lambs with pelts of the right type was received from the N.-W. F. P. Government and considered by the Advisory Board in May 1939. The Board referred the scheme back for elucidation of certain points. The Provincial Government have since resubmitted the scheme after receipt of further information from South Africa and Palestine regarding the production of lamb pelts. The revised scheme is under the consideration of the Council.

Production of Wool

The Advisory Board at their meeting held in May 1939 considered the question of cross breeding of the country sheep with a long wooled sheep for producing better wool for carpets. After a thorough discussion and due consideration of the views expressed by Mr. E. J. Bruen in a note submitted to the Board, it was recommended that the importation of foreign rams should not be encouraged as a general policy for the improvement of the indigenous sheep in the plains in India. It was considered that experiments in Mysore with imported Merino rams may well be considered in Provinces and other States wishing to develop the sheep industry and that Mysore may for this purpose be regarded as a hill and

not a plain area. Further, it was suggested that prior to any further introduction of imported rams, the results of Kashmir and other sheep breeding schemes on these lines should be awaited and meanwhile detailed investigation should be undertaken in regard to the grading up of indigenous stock, diseases of sheep and their nutritional problems. It was also agreed that sheep breeding schemes should be formulated on these lines and when submitted for consideration should include comprehensive information regarding diseases and nutritional problems.

Bihar Sheep Breeding Scheme

In pursuance of the recommendations of the Sheep and Wool Committee, 1933, the Bihar Government submitted a scheme for the improvement of sheep in their province. The scheme was considered by the Advisory Board in December 1939 and was approved with certain modifications. It is awaiting consideration by the Governing Body.

Schemes for the improvement of goats in the United Provinces

This scheme is being worked at the Mission Poultry Farm at Etah since 1931 and is due to expire in June 1941. The report for 1938-39 discloses a record of very useful work and contains information which should be interesting and helpful to all concerned with the subject. The method of preparing sweet cheese described in the report has been published in 'Agriculture and Livestock in India' and reprints have also been distributed for general information. Work in respect of better system of weaning kids at birth and daily milk recording has been recently introduced.

Proposals for a further extension of the scheme for 5 years were received from Mr. Slater of the Mission Farm. They were considered by the Advisory Board in December 1939 and referred back for revision as it was felt that the extension scheme should not include the Jumna-Pari goat which did not thrive well under farm conditions. Further, detailed information has also been sought in regard to the nature of the research work proposed for the period of extension. It was also recommended that the United Provinces Government should be asked to state what amount they were prepared to contribute towards the cost of the scheme. A revised scheme has since been received and is under the consideration of the Council.

Angora Goat Breeding Scheme

With a view to investigating the possibility of rearing Angora goats in India, especially in the North West, so that it may be possible to start a mohair industry, the Council approved of a proposal to depute an experienced livestock officer to South Africa to study the problem locally. The Governments of the Punjab, the United Provinces, the N.-W. F. P. and Kashmir who are likely to be benefited by the scheme agreed to bear a portion of the cost of the scheme and the Council bore a little over half of the total cost. Capt. W. S. Read, Superintendent, Government Cattle Farm, Hissar, was selected by the Imperial Council of Agricultural Research for this purpose and he sailed for South Africa in March 1939. He submitted his report six months later on arrival in India. His report deals in detail with the breeding, rearing and tremendous potentialities of this animal and the possibility of developing mohair industry as an important cottage industry in India. Capt. Read is of the opinion

that pure bred Angora goat can be successfully introduced in many parts of India and that many profitable flocks can be built up. He has recommended skilful cross-breeding with suitable 'local' breeds of goats, with a view to produce types suitable for wider range of climate. In his opinion India was in a particularly favourable position for developing this industry, compared with other 'Angora Countries', on account of the cheap labour available. Mohair was also capable of being put into Indian mills with their existing machinery. There was no necessity to depend upon foreign markets as the whole produce could be absorbed by the textile mills and cottage industry in India.

The Advisory Board who considered the report at their meeting held in December 1939 observed that the Angora goat should be given a fair trial in India both for pure breeding and for cross-breeding work with suitable types of indigenous goats. For this purpose, they recommended that at least three stations should be established and that Provinces and States interested in this industry should be invited to submit schemes on a 50:50 basis. It was considered that a suitable unit to work with would be 50 ewes and 2 bucks for each station, and it was suggested that Mr. Read should be requested to make immediate arrangements with South African firms for the reserving of 10 bucks and 150 ewes on behalf of the Council, on the understanding that this does not commit the Council in any way in regard to purchase, until some provincial schemes had been considered. The extra bucks were meant to serve as a reserve and could also be utilised for special cross-breeding work.

Incidentally, they felt that the development of the Angora goat industry is likely to be greatly facilitated by the extension of artificial insemination on a field scale and suggested that the Government of India should be approached to provide the necessary facilities at the Imperial Veterinary Research Institute, Izatnagar, for applying the advances already made in this subject in Europe to the requirements of India.

Capt. Read's recommendations were communicated to the Provincial Governments for consideration. So far only the Punjab has come forward with a scheme which is under the consideration of the Council. The necessary action to reserve rams and ewes as recommended by the Advisory Board has been taken.

Punjab Goat Breeding Scheme

The objects of the scheme have been mentioned in the previous report. The scheme was started in December 1939 and only preliminaries have so far been completed.

Punjab Indigenous Sheep Breeding Scheme

This work was started in 1937. The scheme is still in its infancy and it is too early to frame any definite conclusions. The prevailing famine conditions did not permit of the work to be developed in the manner originally planned. The second year's report shows that late-born lambs always exhibited a poor body growth. Studies of effects of inbreeding on physical development, the economics of one lamb a year *versus* two, and the breeding of white-faced sheep, are in progress. The study of the gestation period of 106 ewes was completed and it showed an average figure of 151 days. Figures to work out the economic age up to which a sheep may be kept in the flock have been determined. Investigations into the effect of various physiological factors on the growth of wool, the

effects of 'washing' sheep before shearing and the effects of 'dipping' are being continued. The diseases observed amongst the animals during the year were (1) Foot and mouth disease, (2) abortion, (3) Ophthalmia and (4) an obscure disease which was fatal in all the cases. There were, however, no serious losses.

Sheep Breeding Scheme, Bombay

This scheme which was started in November 1937 aims at (1) the improvement of Deccani sheep by selection (2) the adaptability of the Merino to the Deccan, (3) the crossing of Deccani with Merino with a view to find out the possibility of a better animal and (4) work on other problems of sheep husbandry and diseases. During 1938-39 information was collected on Deccani sheep, the quality and quantity of its wool yield and its stamina. Merino sheep were imported in two batches and work with them indicated that they should not be moved over long distance in summer, that they should not be kept on dry pasture alone during summer and that grain should be fed with a mixture of roughage. It is observed that it is advisable to dose them against worms every month; and that shearing must be so arranged as to leave sufficient wool on the backs of the sheep in summer.

Experiments on the crossing of Merino with Deccani furnished rather interesting results, though it was found difficult in the beginning to get the Merino rams used to Deccani ewes.

During the autumn season of the year under report, it was noticed that the weakened and worm-attacked sheep were being continuously infested with sheep-maggot fly. The remedy suggested by the South African veterinary authorities consisting of the following agents was found to be extremely effective:—Carbon tetrachloride, oleum picis, carbolic acid, ammonia, gum and water. The Advisory Board considered that very valuable work had been done under the scheme particularly in regard to the segregation of different types of the Deccani sheep and the technique developed for the examination of wool fibres.

Madras Sheep Breeding Scheme

The scheme was initiated in October 1938. Due to the failure of the North East monsoon, grazing was poor and the sheep were grazed along the irrigation channels and were fed on concentrate food. This arrangement was helpful in maintaining the condition of the flock. No contagious diseases occurred during the period under report. Most of the ewes were found suffering from wire worms, and were dosed. Sheep were washed and clipped twice during the year. The average wool yield for the year for the farm flock excluding hogs and lambs was 5 lb. 2 oz. for rams and 2 lb. 15 oz. for ewes. The Advisory Board, while considering the report for 1938-39, observed that the point whether the fine skin of the Bellary sheep, which is in demand by the trade for the making of rollers, is likely to get coarser as the wool becomes finer should be kept in mind.

(iii) Poultry

Scheme for the improvement of poultry for table purposes in the Punjab

The second report of the schemes dealing with activities during 1938-39 states that six hens of stock provided in the scheme were fully stocked,

and the hens were trap-nested and strict pedigree records of hatchings were maintained. The data collected included egg production of each hen (2) period of broodiness (3) adult and chick mortality (4) weight of egg incubated (5) weight of chick at birth and thereafter (6) weight of breeding stock at monthly intervals and (7) food consumed by young and adult stock.

Poultry Husbandry Scheme, Bombay

The main items of work carried out during 1938-39 were (1) the laying capacity and size of eggs of different breeds (2) the most suitable month for artificial incubation (3) feeding and cross-breeding experiments. Monsoon hatching was found to be satisfactory but rearing of chickens during the heavy rains presented great difficulties. Wheat bran was found to be superior to rice bran in nutritive value. Naked neck hens were mated with White Leghorn cocks and the first generation was found much improved both in body size and egg production. Further experiments are still in progress. The Advisory Board considered that valuable work had been done, particularly in regard to the evolving of fixed type of bird by crossing of the Rhode Island Red with the Chittagong. This type is stated to be very hardy and suitable for Indian conditions. They further observed that it is important that the size and number of eggs produced by any breed under development in this country should not be increased at the expense of the constitution of the birds.

CHAPTER V

ANIMAL NUTRITION

Animal Nutrition Scheme, Coimbatore

This scheme has been in operation since 1935. During 1938-39 mineral metabolism studies with cross-bred cows and Kangayam heifers were continued. The rations fed were the usual dairy rations fed at the Coimbatore College dairy graded for live weight and age of animal. A general review of the data so far obtained indicate that an assimilation of about 35 grams each of CAO and $P_2 O_5$ is adequate for growth and requirement for pregnancy. The figures obtained with cross-bred cows indicate that heavy milk yield is associated with a negative calcium balance.

Blood studies for mineral deficiency were conducted in an area in the Kurnool district, where a disease known locally as *Vayupotlu* (rheumatic pain), resembling osteomalacia or arthritis, is common. The studies showed that while serum calcium was normal, blood phosphorus was very low. A similar field survey in South Kanara showed less pronounced symptoms of deficiency but the general condition of the cattle in this area is also poor. A pasture survey of the east coast district was carried out. Nitrogen partition studies showed that manuring has a marked effect on total nitrogen content and type of distribution of nitrogen in the herbage of cereals.

Experiments showed that feeding with groundnut cake and fish meal as main proteins does not significantly alter the composition of flesh of poultry.

At their meeting held in July 1939, the Governing Body sanctioned extension of the scheme for a further period of two years with effect from 1st April 1940.

Animal Nutrition Scheme, Bengal

This scheme has been in progress since 1932. In January 1937 it was extended for a further period of 5 years. During the period under report, the feeding value of rice straw, when fed with rice by-product (Kura), cake and molasses, was studied. Investigation on the relation of live weight with lime content and lime requirement of adult animals, mineral assimilation from Napier silage, and the feeding values of rice by-products was carried out. It was found that in the case of adult animals, lime content and lime requirements are both a linear function of live weight. Results on experiments with Napier silage indicate that lime supply was difficult in the fodder used. The results suggest that Napier silage should not be fed *ad lib*. Rice by-products of the right type appear to be half as rich in nitrogen as linseed or mustard cake, and are very rich in oil and phosphorus. Four papers embodying the results obtained were published during the year under report. During the next year it is proposed to continue the feeding tests with rice by-products. Investigations into the composition of local grasses and fodders and comparison of the values of *aus* and *aman* straws will also be carried out.

Scheme for the manufacture of Cattle-feed from Molasses

This scheme has been in progress since November 1935 at the Imperial Institute of Sugar Technology, Cawnpore. As the reports on the feeding trials with feeds containing bagasse screenings, oil cakes and molasses, supplied to various centres, showed that the feeds lacked in palatability, work was undertaken to find out how far finer screenings of bagasse would eliminate this trouble. Analyses of bagasse screenings were made and the change in their composition and suitability determined.

Periodic analyses of bagasse screenings kept in the sun and rain and the feeds kept in godowns were also carried out to study their keeping qualities. The reports of feeding trials with bago-molasses at different centres show that the feed is quite economical as a part of ration to animals. It is proposed to carry out a more exhaustive study of the food values of the by-products in collaboration with the Imperial Veterinary Research Institute, Mukteswar.

The Board considered the report in December 1939 and felt that as there was a great deal of variability in the results of feeding trials, it was necessary to withhold further work on such experiments at outstations until the interim report of the preliminary trials on feeding of bago-molasses to bullocks, which were to be carried out at Izatnagar was available. They also suggested that information relating to the cost of bago-molasses at the source of supply should be obtained.

Scheme for Feeding of Cattle at Departmental Farms in the United Provinces

The scheme was initiated in April 1938 and the programme of work during the year under report was to study the effect of feeding green berseem on the growth and milk yield of Hissar and Murrah breeds and the replacement of concentrates by berseem. Six Hissar cows and six

Murrah cows were selected for the experiments at Bharari, Jhansi and six Hissar heifers and six Murrah heifers at Madhurikhund, Muttra. The following observations have been made:—

(1) The growth of the Hissar heifers is not affected if concentrates are replaced to the extent of 50 per cent. by fresh berseem.

(2) Hissar cows maintain their body weight to the same extent with concentrates alone or with concentrates replaced by either 50 per cent. or 75 per cent. fresh berseem.

(3) Growth in Murrah heifers is less if concentrates are replaced by berseem and Murrah cows are not able to maintain their body weights if concentrates are replaced by berseem.

The preliminary results in respect of milk yields have also been recorded.

Bihar Scheme for the Analysis of Indigenous Fodders

This scheme has been in operation since October 1936. During 1938-39, the following work was attempted:—

(1) Influence of age on the composition of fodders, from different localities;

(2) Influence of soil conditions by analysis of samples from widely different localities;

(3) Influence of seasonal effect on the variation in the composition of fodders; and

(4) Study of ten fodders, *viz.*, Juar, Maize, Meth, Khesari, Berseem, Napier grass, Dhoob grass, Paddy straw, Barley bhusa and Wheat bhusa.

Samples of berseem from widely different localities showed that they were remarkably rich in protein and most of the mineral constituents. Meth and Khesari always yielded rich crops, being second only to berseem. All the three leguminous fodders were particularly rich in the three most important constituents, *viz.*, crude protein, calcium and phosphoric acid. Paddy straw and juar were found to be the poorest fodders. Maize was slightly richer than juar and paddy straw. The straws of wheat and barley were slightly richer than paddy straw with respect to most constituents and specially with regard to phosphoric acid in which constituents paddy straw is very poor. Dhoob grass and Napier grass occupy position intermediate between the rich and poor fodders. Most of the constituents, specially the minerals in the fodders, tended to decrease with advancing age, the main exception being nitrogen-free extract which always increased with age. In certain cases this did not hold true on account of some disturbing conditions. Influence of soil conditions were very marked and all fodders growing at Sabour, Darbhanga, Pusa and Patna are expected to be rich in most important constituents, *viz.*, protein calcium and phosphoric acid, whereas fodders growing at Kanke, Jamui, Nawada and Banka may be poorer. The latter, however, are richer in iron and manganese. The fodders grown in 1938 season were richer than fodders grown in 1936 or 1937. The 1937 crop was the poorest.

Lyallpur Scheme for Determining the Feeding Value of certain Food Grains, Oil Seeds and Oil Cakes

This scheme has now been running for a little over a year. The technical programme of the scheme was prepared in collaboration with the Council's Statistician and was approved by the Advisory Board at their meeting held in May 1939. The programme as approved provides for a study of six varieties of oil cakes, four varieties of oil seeds and fourteen varieties of grains.

An application for supplementary grant to extend the investigation to dairy cattle was received and considered by the Advisory Board at their meeting held in December 1939. The Board approved it with certain minor modifications.

Mukteswar Scheme for Investigating the Feeding Value of Molasses to Cattle

Feeding trials with bago-molasses have been undertaken at five centres in India. Experience has shown that bago-molasses could be fed to milch cows upto a maximum of 8—10 lbs. without any harmful effects; that one lb. of bago-molasses was equal to 1 lb. of roughage (Ragi straw) in feeding value and that 3 lbs. of bago-molasses was equivalent to 1 lb. of the mixture of balanced ration. The results obtained so far indicated that further scrutiny and verification based on a detailed scientific investigation was necessary. With this object in view, the Director, Imperial Veterinary Research Institute, submitted a scheme for investigating the feeding value of molasses for bullocks. The Advisory Board approved the scheme at their meeting held in May 1939 and recommended that it should be started forthwith and that the Director should be requested to submit a supplementary scheme to include work on milch cows and young stock and that this scheme should run concurrently with the main scheme. The question of financing the main scheme from the sugar funds is under consideration of the Governing Body. The supplementary scheme submitted by the Director, was considered by the Advisory Board at their meeting held in December 1939. It was recommended that this scheme should be postponed until such time as the results of the preliminary trials on bullock are available and that it should be revised in the light of the experience gained from these trials.

CHAPTER VI.

DAIRYING

Adulteration of Dairy Products

A set of model rules has been prepared on this subject for circulation to the Provinces and States. These rules were considered by the Standing Dairying Committee and the Advisory Board who made certain additions and alterations. These draft rules were examined by the Public Health Commissioner with the Government of India who has suggested that they may be held over until the *ad hoc* Food Adulteration Committee of the Central Advisory Board of Health has had the opportunity of reviewing the problem in all its three aspects—technical, administrative and legal. The recommendations of this Committee are awaited and the model rules will be resubmitted to the Standing Dairying Committee or

the Dairy Legislation Committee, as the case may be, after examining them in the light of the recommendations of the Food Adulteration Committee, when they become available.

Affiliation of the Imperial Council of Agricultural Research to the International Dairy Federation

The Governing Body at their meeting held in 1939 approved the proposal of the Standing Dairying Committee of the Council that the Imperial Council of Agricultural Research should join the International Dairy Federation as a society representing producers, the Animal Husbandry Commissioner with the Government of India functioning as the official correspondent for the Federation in India. Necessary action to effect affiliation could not be taken on account of war. The proposal has, therefore, been held in abeyance for the present.

Milk Recording, Pedigree Registration, etc.

The Council's activities on these subjects are enumerated in the paragraphs under Animal Husbandry Bureau in the chapter dealing with Animal Industry.

Scheme for Research into the Composition of Milk at the Allahabad Agricultural Institute

This scheme was started in July 1936 for a period of two years and was extended for a further period of one year, *i.e.*, up to the end of June 1939. The report for the third year of the scheme shows that analyses were carried out of the chemical composition of some 802 samples of milk during the year. Freezing point determinations and quantitative determinations on the ash were also made in some of the cases. For these experiments, 48 milking animals of different ages and calving were taken to constitute a typical herd. Some of them were from those reared on the Institute Farm and others reared in villages under ordinary conditions. Tests were carried out with individual samples, composite samples produced in a 24-hours period by the individual and herd samples obtained by mixing the milk of the animals in the herd.

The report which is highly technical, was first examined by the Director of Dairy Research. The comments of the Director were forwarded to the Institute for guidance while preparing the final report on the scheme which is due. The statistical data relating to the scheme will be dealt with by the Animal Husbandry Bureau of the Council in consultation with the Director of Dairy Research.

Problem of Supply of Milk from Villages to Towns

The question of the supply of milk from villages to towns has come up for discussion a number of times. Such a supply is essential in the interests both of the village producer and the town consumer, but there are a large number of practical difficulties associated with this problem on which there is no precise information available. A suitable advice based on the combined experience of the members of the Council will be of great value to governments, local bodies, individuals and private concerns which intend to undertake such supplies. The matter was accordingly considered by the Standing Dairying Committee and the Advisory Board at their meetings held in December 1939. The general concensus

of opinion was that one method of tackling this problem would be the establishment of Central Co-operative Dairies in suitable rural areas where milk sells much cheaper than in towns and along with this the establishment of central creameries should also be considered for dealing with surplus milk. Further details in this connection should be worked out with the assistance of the Live-stock and Dairy Officers in the Provinces. This subject also involves the prosecution of fundamental research. The problems relating to processing, transportation and distribution of milk and its by-products require investigation at the Central Dairy Institute. Further, it was stressed that the provisions of the Municipal Acts should be more rigidly enforced in order to check the adulteration of milk and its by-products in towns. The Board recommended that the following questionnaire might be circulated to the members of the Dairying Committee and the problem reconsidered in the light of replies received:—

(*a*) The types of organisations suitable for different conditions with special reference to methods of (i) assembling small owners, (ii) advancing loans to them, where necessary, for purchase of cattle on condition of repayment in easy instalments through milk and (iii) supply of feeds at wholesale rates, the price being deducted from payment for milk.

(*b*) What type of shed or other structure is required, if any, and how sanitary conditions may be ensured in the milking premises.

(*c*) Supervision of milking, weighing and recording of milk.

(*d*) Should the milk be conveyed direct to the distributing centre in the town or is an assembling station necessary and if so what should be its maximum distance from the villages from which the milk is collected and what distance from the town is desirable.

(*e*) The type of cans and also the mode of conveyance for transport to assembling station. Whether, and if so what, cooling arrangements are necessary during transit.

(*f*) Precautions necessary to prevent adulteration before despatch or *en route* to assembling station. The tests that may be carried out to detect any adulteration.

(*g*) Functions of the assembling station and the equipment necessary thereat. The method of processing, if any, required there.

(*h*) The most suitable arrangements for transport from the assembling station to the distributing centre in the town.

(*i*) Processing, if any, that may be considered necessary before distribution.

(*j*) The method of distribution and the precautions to be adopted against adulteration.

(*k*) The best method of disposal of the surplus milk.

(*l*) The most suitable time for the different operations.

The necessary reference was made and all the replies have been received. In addition to the members of the Standing Dairying Commit-

tee, certain more important co-operative milk unions have also been consulted and replies have been received. The whole matter is now being examined for resubmission to the Advisory Board.

Salvage of Dry City Milch Stock and Supply of Milk to large Cities

As mentioned in previous reports, this subject has been considered from time to time. The Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry considered, after a detailed discussion of the problem, that a special committee of people closely associated with the subject, should be appointed to investigate the question on the spot at the three Presidency towns and endeavour to elucidate a course of action which would be assented to and co-operated in, by the authorities concerned. The Wing's recommendation was considered by the Standing Dairying Committee and the Advisory Board of the Council at their meetings held in December 1939 with a view to find out how the recommendation should be given effect to and what the terms of reference to the special committee should be. After exhaustive discussion the Board considered that the recommendation of the Wing should be accepted and an expert committee appointed for re-investigating the problems in the three big cities of India. The personnel of the Committee should consist of the Animal Husbandry Commissioner with the Government of India, a representative each of the Imperial Dairy Department and the Central Marketing Staff, Sardar Bahadur Sir Datar Singh to represent cattle breeders in the Punjab and four or five suitable officials and non-official members co-opted in each of the three cities. The terms of reference to the Committee should be as under:—

(i) Is it advisable and feasible, in view of local conditions, to make arrangements for moving *gowalas* and their cattle outside city limits?

(ii) If so, what is the best way of giving effect to this recommendation in each of the three cities and what steps should be taken to make milk of good quality available in cities?

(iii) If moving *gowalas* out of cities is not feasible, what other action is recommended?

(iv) To what extent will the interest of the cattle breeders in the breeding tracts be affected by reducing the trade in milch cattle to large cities?

The co-operation of the Provincial Governments and Corporations concerned is essential for the successful completion of the labours of the Committee, as it would rest with them to implement its recommendation. They have accordingly been asked whether they would be pleased to lend the Committee their valuable collaboration.

Scheme for Research into the Products and By-products of Milk at the Anand Creamery

The Governing Body decided that this scheme, as it stood, be dropped and that the Director of Dairy Research should be invited to formulate fresh proposals in the light of Dr. Wright's recommendations. The Director was accordingly asked to submit his proposals but has suggested that the matter may be held in abeyance pending consideration of proposals connected with the Central Dairy Research Institute.

CHAPTER VII.

ANIMAL INDUSTRY

Animal Husbandry Bureau.—Collection, collation and publication of information relating to animal husbandry matters, which is the main function of the Bureau, was continued as usual. Milk records received for publication showed a considerable increase, and further advance was made during the year towards the registration of pedigrees and the initiation of Herd Books.

The second volume of milk records consisting of records received during 1937-38 was sent to the press. The records for the year 1936-37, which was issued as Miscellaneous Bulletin No. 18 contained over a thousand records only. The Volume II, which will appear shortly as Miscellaneous Bulletin No. 36, contains over 4,000 records and is being issued in two parts. It is proposed to bring out future records separately for each of the more important breeds. This will reduce the bulk of the publications and enables the readers to choose the publication relating to particular breeds in which they are interested.

A detailed note was prepared during the year regarding the steps to be taken, the procedure to be adopted, and the rules and regulations to be observed in regard to the initiation and operation of Central Herd Books. The note was considered by the Advisory Board and has been circulated to Provincial Governments. As soon as the Provinces concerned concur and make the essential local arrangements, Central Herd Books will be started in respect of the Hariana, Sindhi and Sahiwal breeds, to begin with.

Most of the farms owned by Provincial Governments were visited during the year and their records and methods of milk recording were studied. Standard forms of Cattle History and Pedigree Sheet were distributed to the farms to make their records more complete and comprehensive and to introduce uniformity.

With a view to encourage bull recording and to facilitate the study of progeny tests, a standard form of register was drawn up for the systematic recording of the services of dairy bulls and of the milk yields of their daughters. The register was considered by the Standing Dairying Committee and recommended for adoption in Dairy Farms in India.

The data which had been collected sometime back through questionnaire from Provinces and States regarding the cost of production of milk by *gowalas* were examined in detail and an interim report based upon data from the Punjab was drawn up. This report drew attention to the general incompleteness of the answers to the questionnaire and the serious limitations to which conclusions based on them are subject. The Advisory Board discussed the report and while emphasising the importance of collecting information on the subject, considered that it was not worth while continuing analysis of these defective data and suggested collection of similar information from Co-operative Milk Societies. Steps are being taken for this purpose.

A number of charts relating to animal industry in India was prepared during the year and exhibited at the All-India Cattle Show held in February 1940. These charts showed the population of cattle and other livestock in different countries, per capita production and consumption of milk, import, export, etc., and were very much appreciated by the

visitors. A stall was run by the Bureau and apart from the display of exhibits of animal husbandry interest, sales of the Council's bulletins were organised.

As usual, arrangements were made for taking standard photographs, against a common measure board background, of prize winners at the All-India Cattle Show for permanent record in the Bureau. Considerable advance was made during the year in the collection of photographs of typical animals and in the recording of these photographs in a chronological order. There are nearly three dozen albums now, one for each breed, which any visitor interested in the subject will be delighted to see. Recording, as the photographs do, the ideals aimed at in breeding from time to time, these albums will, it is hoped, throw considerable light, in course of time, on the evolution of each breed.

A specimen map showing the areas of distribution of the different breeds and types of cattle in India was prepared, and the question of preparing a wall map from the specimen is now under consideration.

A popular article on the feeding of milking stock was prepared for publication in 'Indian Farming'. A review of the scales of feeding adopted in different farms in India is under preparation.

Display of exhibits of the Livestock Industries of India, in the Imperial Institute, London.

The show stalls of the Imperial Institute, London, lacked suitable exhibits which could truly represent the immense potentialities of Indian livestock and livestock products. To arouse interest in this subject and to educate nationals of various countries in respect of Indian products, the following articles were despatched to the Institute, which attracts a large number of visitors, during the period under review.

1. A collection of photos of the second All-India Cattle Show.

2. Two boxes containing 22 samples of wool supplied by the Agricultural Marketing Adviser to the Government of India.

3. One box containing samples of five empty tins for packing AGMARK ghee.

4. 18 photos of sheep and sheep-shearing supplied by Messrs. Read, Bruen and the Chief Marketing Officer, Bombay.

5. Seventeen photos of Mysore sheep supplied by Lt. Monteiro together with a descriptive list.

6. One album of 68 photo prints dealing with Dairy Industry in India together with their descriptive list received from the Imperial Dairy Expert.

7. One album containing the negatives of the above photos from the Imperial Dairy Expert.

8. One album containing the photographs relating to tanning industry supplied by the Cooper-Allan Tannery together with a descriptive list.

9. Two photographs of Kashmere sheep.

10. 26 photographs received from Rao Sahib Kylasamier, Madras for a Diorama.

11. Five samples of finished leather with descriptive labels.

12. Seven dummy tins used for packing dairy products received from Messrs. Polson Ltd. and Messrs. Edward Keventer Ltd.

CHAPTER VIII.

PISCICULTURE

Scheme for the Investigation of the Life History, Bionomics and Development of Fresh Water Fishes of Bengal.

This scheme is in operation since December, 1936. The report for 1938-39 reveals that experiments were conducted to determine the suitable economical artificial foods for various kinds of fish. Various pulses were tried with the fries of *L. rohita* and their values were determined. It was found that *chhola* gave the best result. Powdered meat and blood, in the form of a paste with rice were tried with the fingerlings. Meat and rice gave better result for *L. rohita*. Rice, peas and flour were given in combinations of peas and rice and peas and flour to the fingerlings and the adults of *L. rohita*, *L. calbasu* and *C. mrigala* for determining the comparative merits of their combinations. Peas and flour gave better results in the case of *L. rohita* and peas and rice for *C. mrigala* and *L. calbasu*. Certain natural foods, *e.g.*, snail, protozoa, crustaceans, mosquito larvae and algae were also fed in different combinations. Algae, snail and protozoa gave better results in the case of *C. mrigala* and algae, crustaceans and mosquito larvae for other groups. Habits and habitats of some fish, seasonal fauna of the *jhil* in relation to fish life, artificial fecundation, secondary sexual characters, kind of eggs and breeding habits were also studied.

The Calcutta University submitted an application for the extension of the scheme. The Advisory Board, at their meeting held in December 1939, considered and approved the proposal to extend the scheme for three years and recommended *inter alia* that information on fishery problems which were being investigated or are proposed to be investigated in future in the various parts of India, particularly Punjab, Madras and Bombay, should be collected and collated. The relevant information has been collected and further action in respect of developmental research is under consideration.

Orissa Fish scheme

Mention has been made in the previous report of the Orissa Government scheme relating to biological investigations in the Chilka lake fishery. The scheme was considered and approved by the Council and necessary funds were placed at the disposal of the Provincial Government. The scheme has, however, been dropped as the Provincial Government intimated their inability to meet their share of the cost.

Fishery Research in India.

In their report, the Royal Commission on Agriculture observed that "the addition of fish to the diet of the cultivator seems to be the most promising way of securing the improvement in his nutrition which is so much needed" and recommended that "all measures practicable to this end should be taken". Pursuant to this recommendation the problems of research and development of fisheries, which are primarily the concern of Provincial Governments, have been under the consideration of more than one Province and some preliminary investigation has been undertaken, particularly in some of the maritime Provinces.

2. In so far as the Imperial Council of Agricultural Research is concerned, owing to its limited financial resources and the pressure of agricultural and veterinary schemes, it has not been possible till now to finance large scale investigations on pisciculture. However, some assistance has been provided and the following schemes have so far been considered by the Council:—

(1) *Madras.*—(*a*) research on rural pisciculture,

(*b*) research for improving the fishery industry and developing the supply of fish manure.

(2) *Bengal.*—Investigation of life-history, bionomics and development of fresh water fishes in Bengal.

(3) *Orissa.*—Biological investigations at the Chilka lake fishery.

The two schemes submitted by the Madras Government could not hitherto be financed. They are being reconsidered. The other two schemes have already been dealt with earlier.

Further, a Fish Marketing Survey, is being carried out by the Agricultural Marketing Adviser to the Government of India, which, it is hoped, will furnish valuable information on problems relating to collection, transport, handling, marketing, etc.

In pursuance of the recommendation of the Advisory Board that information on fishery problems which were being investigated or are proposed to be investigated in future in the various parts of India, particularly in the Punjab, Madras and Bombay, should be collected and collated for the information of the Fish Committee, the Provincial Governments were addressed in the matter. All the replies have been received and are now under the consideration of the Council.

Some of the main problems which seem to require consideration in this connection are:—

(i) The necessity for a Central Organisation of some form for co-ordinating research on marine, river and tank fisheries;

(ii) collection and co-ordination of information relating to marketing, transport, handling, etc. of fish;

(iii) the provincial organisation required for the introduction of fish culture in hatcheries and rearing stations and by egg collection, regulation of nets, gears and fishing operations generally, enforcement of closed seasons and prevention of wanton slaughter etc.;

(iv) factors involved in the spawning of food fishes, parasites, food and growth of fishes, their diseases etc.;

(v) the possibility of allotting specific problems of research to suitable provinces on a co-ordinated basis, and

(vi) the advisability of attaching a sub-station for fish to the proposed Canning Institute for fruit etc. at Lyallpur and the site for its location, if approved.

The whole matter is now under the consideration of the Fish Committee and the Advisory Board.

PART III.—Miscellaneous.

CHAPTER I.

STATISTICAL SECTION

During the year under report there was an important change in the staff of the section. Rao Bahadur M. Vaidyanathan, the Statistician resigned his post at the end of December and the Statistical Assistant, Mr. S. S. Iyer was appointed to officiate as Statistician from January 1940.

The primary activities of the Section *viz.*, the scrutiny of technical programmes and progress reports of schemes financed by the Council were continued. As usual most of the Agricultural and Animal Husbandry workers both under the Council's schemes and outside availed themselves of the services of the Statistician in the planning of experiments and their analysis and interpretation.

References from Provinces and States seeking technical advice and assistance on statistical matters numbered 289 as compared to 243 in 1938-39 and 112 in 1937-38.

In connection with the standard manurial experiments on rice and sugarcane carried on at a number of places as suggested by the Joint Committee on Field Experiments, a note on the method of calculation of a 3^3 "confounded" design was circulated by the Statistician. A complete note on the analysis of 3^3 and 3^4 designs has also been written up and published in the Indian Journal of Agricultural Science (April 1940).

Besides the note on 3^3 and 3^4 designs two other papers were written up and published in collaboration with the Padegaon workers:—

(1) Sampling of sugarcane for chemical Analysis; I. J. A. S., Feb. 1940.

(2) A study of plot size and shape technique for field experiments on sugarcane, I. J. A. S., June 1940.

CHAPTER II.

AGRICULTURAL MARKETING

As a result of the impetus given by the Ministers' Marketing Conference, opened by H. E. the Viceroy in November 1938, and of the subsequent interest shown by the Ministers themselves, the year was everywhere marked by an expansion in development work of a practical character. This inevitably led to some reduction in the rate of output of the all-India marketing survey reports.

(i) *Surveys.*—The report on the marketing of Tobacco in India and Burma was published and the report on Grapes was in proof. Abridged editions of the Linseed report were issued in English, Hindi, Urdu, and Bengali and the Marathi version was under print. The abridged report on Eggs in English was sent to the Press and its translation into simple Hindustani was in hand. Abridged editions of all the main reports will continue to be issued by the Central Marketing Staff in English and Hindustani—both Hindi and Urdu scripts. It has been arranged that

provincial and State Governments will thereafter publish these reports in other important local languages. The Madras Government have already arranged for the publication of the provincial report on the marketing of Eggs in English, Tamil, Telugu and Malayalam. The Madras Tobacco report was also being prepared on similar lines. In the Central Provinces and Berar, abridged editions of the provincial marketing survey reports on Wheat and Linseed were under preparation. The United Provinces Government were considering the question of publishing the local reports in an abbreviated form. In the Punjab, notes were issued on different aspects of grading and marking work. In Bombay and Bengal, leaflets embodying the results of the experimental grading work were published by the provincial Marketing Staff and summaries of a number of local survey reports were published by the Mysore Marketing Staff in the State Information Bulletin. Special surveys were undertaken in Bengal on cardamom and arecanuts, in Patiala on chillies and in Orissa on turmeric. The all-India survey reports have reached an advance stage of preparation in respect of rice, cocoanut, groundnut, milk and potatoes and compilation and checking work is proceeding on the reports for cattle, hides and skins, co-operaitve marketing and markets and fairs.

(ii) *Grading and Standardisation.*—The Agricultural Produce (Grading and Marking) Act, 1937 was extended to many additional commodities. The schedule to the Act now includes 14 items, *viz.*, Fruits, Vegetables, Eggs, Dairy produce, Tobacco, Coffee, Hides and Skins as well as the following which were added during the year, *viz.*, Fruit products, *Ata*, Oilseeds, Vegetable oils (including hydrogenated oils and vegetable fats), Cotton, Rice and Lac.

Specifications for standards of quality and rules for grading and marking were prepared and issued for most of the additional commodities. This involved the examination of a large number of samples and considerable negotiations with the interests concerned.

Apart from 28 experimental grading stations operated by the Central Marketing Staff—two of which were subsequently taken over by provinces—165 grading stations were opened by provincial and State Marketing Staffs during the year. Before the end of the year over three-quarters crore rupees worth of AGMARK products had been put on the market with, in most cases, appreciable financial benefit to the parties concerned.

(iii) *Quality Control.*—An important new principle was for the first time introduced and accepted by authorised packers for the payment of AGMARK labels with a view to recovering a part of the cost of quality control work. To ensure that the standard of quality is maintained and the reputation of the 'AGMARK' safeguarded, it is essential to examine a larger number of consignments and to collect and analyse samples of the produce. Accordingly, a Central Control Laboratory staff is being maintained and 90 persons have been authorised, in addition to their other duties, to inspect graded produce in the provinces and minor administrations. This quality control work involves a good deal of expense, but it is hoped that this aspect of the scheme will eventually become, to a large extent, self-supporting.

(iv) *Standards of Weight.*—Following on the strong recommendation made by the Ministers' Marketing Conference, a Standards of Weight Bill was, at the instance of the Commerce Department, passed by the Central Legislature and received the assent of the Governor-General on 28th March

1939. Pending the issue of the necessary rules under the Act, draft Bills for giving local effect to the standards of weight prescribed under the Act were under consideration in Madras, Bengal, United Provinces, Central Provinces and Berar, Assam, North-West Frontier Province and Patiala. In the Punjab and Bihar it was contemplated that the standards of weight as prescribed in the Act would be adopted in the regulated markets to be established under new markets legislation.

(v) *Adulteration.*—The marketing surveys showed the practice of adulteration to be very widespread. Practical difficulties were experienced in developing the trade—particularly inter-provincial—in standardised products, partly owing to the difference between the standards prescribed for AGMARK produce—notably in the case of ghee—and those prescribed in different provinces which, in themselves, also differ considerably. This was brought to the notice of Government and the question was considered by an *ad hoc* committee of the Central Advisory Board of Health on which the Agricultural Marketing Adviser was represented.

(vi) *Marketing Legislation.*—Legislation for the regulation of Agricultural produce markets was passed in the Punjab, North-West Frontier Province and Mysore. Corresponding Bills were introduced in Bengal, Sind, United Provinces and Bihar. Unfortunately, in the two latter provinces, this line of development received a check owing to the resignation of the Ministries. This circumstance also led to the consideration of similar steps being abandoned in Orissa. Bills for the regulation of markets were under consideration in Travancore and Bahawalpur States. In Bombay, where legislation for the regulation of cotton markets already existed, an Act was passed to include the regulation of other kinds of agricultural produce. The extension of existing legislation was also under contemplation in Madras, Central Provinces and Berar, Hyderabad and Baroda.

The Agricultural Produce (Grading and Marking) Act, 1937 with the corresponding rules had, by the end of the year, been adopted or appropriate measures were under active consideration by the following States, *viz.*, Baroda, Patiala, Porbandar, Nawanagar, Gwalior, Mysore, Hyderabad, Kashmir, Travancore, Junagadh and Sikkim.

(vii) *Market News—Price control.*—The provision of market information regarding prices and supplies, particularly for the benefit of rural listeners, was further extended during the year. The outbreak of war gave an impetus to the collection of prices of agricultural produce and since then practically all the local marketing staffs in provinces and States have been keeping in close touch with the day to day price movements.

(viii) *Futures Trading.*—The Ministers' Marketing Conference had asked that this subject should be examined with a view to eliminating the more undesirable elements. The examination showed that many of the bodies controlling futures markets and many of the commission agents and other operators were lacking in financial stability. Some were definitely of a doubtful character. At the same time, certain futures markets were not sufficiently well organised to fulfil their proper function as a hedge market where buyers and sellers might cover their price risks. A detailed note on futures trading in agricultural produce in India and abroad with suggestions regarding measures required for the improvement of trading conditions was submitted to the Government of India for consideration.

(ix) *Price Insurance.*—Price stability for commodities constituting the output of small producers needs consideration. The sugar legislation in Bihar and the United Provinces probably originated with this idea and the projected Bihar Lac Control Bill (now in abeyance) was somewhat similarly designed. During the year a scheme for the stabilisation of jute prices was prepared and submitted to the Indian Central Jute Committee which appointed a small sub-committee to consider the proposals in more detail. At the instance of the Standing Rice Committee of the Imperial Council of Agricultural Research, proposals were also formulated with a view to stabilising, to some extent, the price of rice in certain leading consuming areas. The result of further consideration by the interests concerned is awaited.

(x) *Trade Conferences.*—Apart from the usual annual conference of Senior Marketing Officers in provinces and States, with the Central Marketing Staff, eight conferences were held during the year in regard to groundnuts, edible oils, hydrogenated vegetable product (Vanaspati), citrus fruits, ghee and butter. Manufacturers and traders attending those conferences have taken a keen interest and adopted a helpful attitude towards marketing problems. At the same time, they have derived distinct benefit from the contacts which they have established between one another at those meetings since, in many cases, they present the first opportunity for mutual consultation on matters affecting the particular trade or industry.

(xi) *Miscellaneous.*—Work on the production of standard containers continued in the Punjab, North-West Frontier Province, Bengal, Madras and Travancore. By the end of the year, more than 50 lakh eggs representing over 90 per cent. of the eggs exported from Travancore were transported in standard egg containers. Breakages and wastage have been reduced and the railway companies have been very helpful in encouraging this class of work by allowing reduced rates on produce handled in such containers, and also on returned empties.

In retrospect when the work of the past year is compared with that of earlier years, it can be seen how much real progress has been made. Local marketing staffs in provinces and States have now acquired a considerable measure of competency and initiative in undertaking practical schemes for improved marketing in their areas. This is a big step forward and it is satisfactory to note that it has been achieved within the original five years allotted to the scheme.

The fifth annual report of the Agricultural Marketing Adviser to the Government of India, which includes summarised reports of the marketing staffs in provinces and States, has been published elsewhere.

(xii) *Cold Storage.*—The problems of refrigerated transport and cold storage were again taken up during the year 1939. It was considered desirable to undertake an All-India survey on cold storage and refrigerated transport of perishables and an Assistant Marketing Officer was appointed for this work in September 1939 by the Imperial Council of Agricultural Research. He was attached to the office of the Agricultural Marketing Adviser.

The officer was engaged in making preliminary arrangements with regard to the survey and rail transport tests. Experiments are being undertaken to collect sufficient data relating to the optimum transport

conditions of different perishables and the response of the market to cold-stored produce. It is also desired to study the suitability of the different types of experimental vans with regard to cost of refrigeration and efficiency of maintenance of optimum conditions *en-route*.

In this connection a preliminary trial on a dry ice van was undertaken in September 1939 in co-operation with the N. W. R. and Messrs. Dry Ice and Refrigerators Ltd., Lahore. The trial included transport of a commercial consignment of over three tons of grapes from Quetta to Calcutta and the results were encouraging. The consignment arrived in a better condition than a similar lot transported in other types of fruit vans and the produce generally fetched a higher price. This experiment was undertaken jointly by the army authorities, the Railway Board and the Imperial Council of Agricultural Research.

At the request of the Kashmir Government a scheme regarding cold storage, refrigerated transport and marketing of the Kashmir produce was prepared and forwarded. The design of a suitable plant and details of its working were supplied to the Delhi Improvement Trust in connection with the proposed erection of a cold store at the new fruit and vegetable market. Similarly, help was rendered to a number of private persons interested in the preservation of seed potatoes and other perishables. A number of public enquiries in respect of cold storage were also attended to.

CHAPTER III.

PUBLICATIONS

(i) *Journals.*—Reference was made in the last report that the Governing Body approved of the proposal for the conversion of the Council's bimonthly journal—*Agriculture and Livestock in India*—into a popular monthly magazine. The new magazine, *Indian Farming*, published monthly from January 1940, is designed to convey, in popular language and with the aid of illustrations, the latest news of agricultural and veterinary research, new developments in theory and practice and the solution of farmers' difficulties. In addition to original articles, there are sections devoted to news from research institutions, reports from the provinces and States, answers to readers' queries, cuttings from Indian and foreign journals and reviews of new books. The aim is to present an all-India picture of research and development in agriculture and animal husbandry. The reception given by the public to the venture has been extremely gratifying. The contents of the magazine are offered to registered newspapers and periodicals for reproduction and translation so that the information it contains may reach a wider circle of the reading public. *Indian Farming* has already established a larger circulation than *Agriculture and Livestock in India*, and it is on the increase.

The four issues of *Agriculture and Livestock in India*, which were published during the year under review, contained 31 original articles, of which 7 related to crops and soils, 7 to animal husbandry and the rest to general agriculture. In addition 78 abstracts, 34 notes and 5 reviews were published. In the series of special popular articles for practical farmers the following two were issued:—

1. Locusts in India and their control.
2. The menace of rabid dogs.

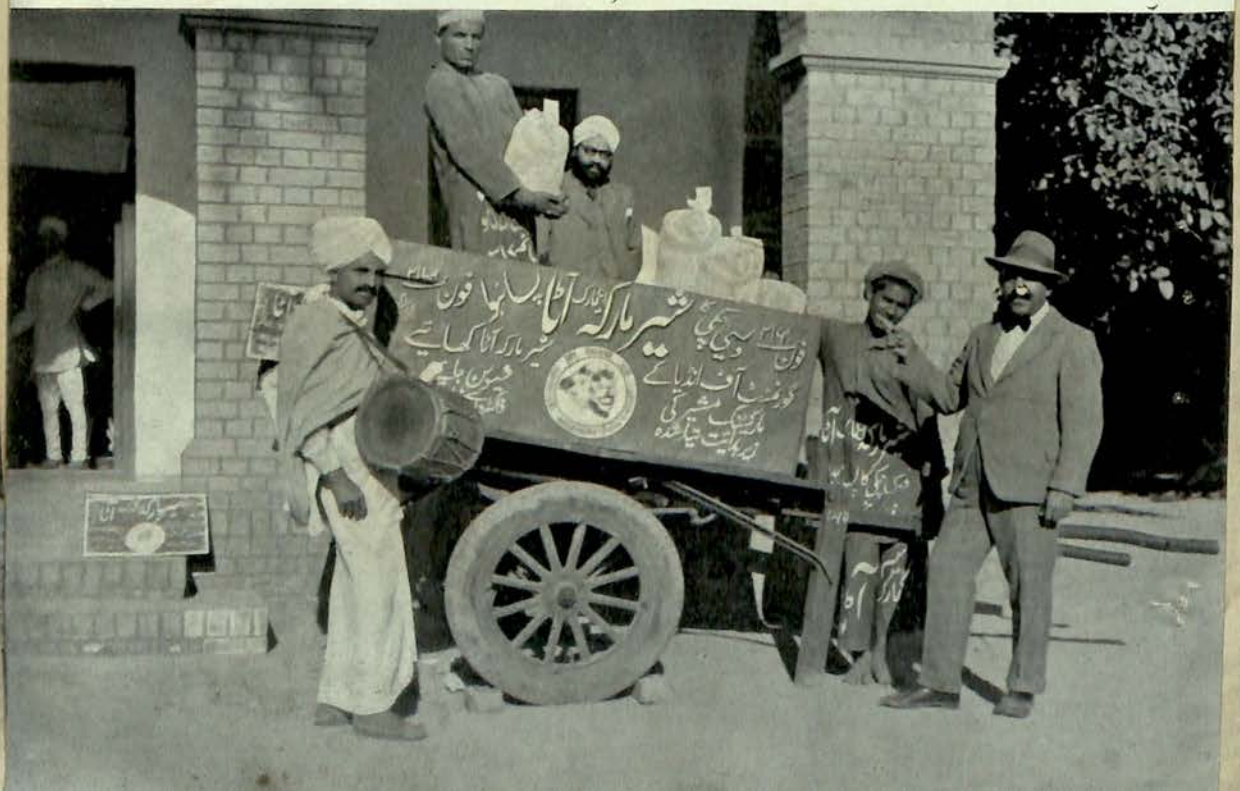
H. E. the Viceroy visits the Agmark stall at the All-India Cattle Show held at Delhi in February, 1940

PLATE V]

Grading of Kodur chinese oranges at Kodur Fruit Growers' Cooperative Society, Ltd., Madras

PLATE VI]

Sale of graded *ata* in Lahore



"In pursuance of the recommendations made in connection with the conversion of the Council's bi-monthly journal *Agriculture and Livestock in India* into a popular monthly magazine, the appointment of an Editor was sanctioned and Mr. F. M. de Mello, B.A., B.Sc. (Econ.) was appointed thereto."

The following editorials appeared in the four issues of *Agriculture and Livestock in India*:—

1. Balanced research.
2. Intensive dairy methods in India.
3. Cattle improvement in India.
4. War.

The following two articles, which formed the last in the series of the illustrated articles on *Sons of the Soil* (Studies of the Indian Cultivator), were published:—

1. The Korku cultivator.
2. The N.-W. F. P. cultivator.

Twenty-four articles have been published in this series so far. In order to meet the public demand for these articles, they are being republished in the form of a popular book.

The Indian Journal of Agricultural Science published 50 original articles, of which 14 are botanical, 13 chemical, 9 entomological, ten on plant diseases, two on horticulture, one each on agricultural meteorology and cotton technology. In addition, there were two research notes, two abstracts and 11 reviews.

Of the 53 original articles published in the *Indian Journal of Veterinary Science and Animal Husbandry*, 45 related to animal diseases, four to dairying, one to animal nutrition and three to general animal husbandry. In addition, 20 abstracts of selected articles from foreign literature which are of interest to Indian workers were published during the year.

(ii) *Preparation of critical monographs on Indian research work.*—Mention was made in the last report that the Council would undertake the preparation of certain critical monographs on the lines recommended by Sir John Russell. The scheme for the preparation of the monograph on 'Dry Farming in India', received from the Government of Bombay at a total cost of Rs. 5,700, has been approved by the Governing Body at their meeting held in July 1939. The Government of Bombay have been requested to take the work in hand as early as possible. Schemes for the preparation of the monographs on (1) 'Animal Nutrition in India', (2) 'Rinderpest in India', (3) 'Rice breeding and Genetics in India' and (4) 'The Anatomy of the Ox' are under consideration.

(iii) *Monographs, Bulletins* and other publications issued during the year are as follows:—

(*a*) *Scientific Monograph No. 13.*—Further observations on Anatomical Deviations in the Ox and Notes on certain Anatomical Freaks, by H. N. Chelva Ayyangar.

(*b*) *Miscellaneous Bulletins*—

No. 6.—Bee-keeping, by C. C. Ghosh (4th edition).

No. 30.—Biological Notes on Indian Chalcidoidea, by Hem Singh Pruthi and M. S. Mani.

No. 31.—Studies in the Preservation of Fruit and Vegetables. An Investigation on the Methods of Preparation and Standardization of Tomato Ketchup, by Lal Singh and Girdhari Lal.

No. 32.—Studies in the Preservation of Fruit Juices, I. Some observations on the Preparation and Preservation of Citrus Fruit Squashes, by Lal Singh and Girdhari Lal.

No. 33.—Selected Clinical Articles, Part III, by Mohammad Rahimuddin, C. C. Uttangi, R. C. Nathani and N. S. Sankaranarayanan.

(*c*) *Agriculture and Animal Husbandry in India, 1937-38.*

(*d*) *Marketing Series (Agricultural Marketing in India).*

A. M. A.-10.—Report on the Marketing of Tobacco in India and Burma.

A. M. A.-12.—Report on the Marketing of Linseed in India (abridged edition).

(*e*) *Catalogue of Indian Insects.*—No. 24, Evanidae, by M. S. Mani.

(*f*) *Miscellaneous*—

I. C. A. R. 19-VII.—Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. VII, Central Provinces and Berar.

I. C. A. R. 19-VIII.—Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. VIII, Sind.

I. C. A. R. 19-IX.—Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. IX—States of Hyderabad, Baroda and Mysore.

I. C. A. R. 20-I.—Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India—Supplementary Vol. I (The Punjab).

I. C. A. R. 20-II.—Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India—Supplementary Vol. II (Bombay).

I. C. A. R. 20-IV.—Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India—Supplementary Vol. IV (Madras).

I. C. A. R. 20-VIII.—Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India—Supplementary Vol. VIII (Sind).

The following publications were in the Press at the end of the year:—

Scientific Monograph No. 14.—Further Studies on Cereal Rusts in India, by K. C. Mehta.

Scientific Monograph No. 15.—The Poisonous Plants of India, by Lt.-Col. R. N. Chopra.

Miscellaneous Bulletins:—

No. 29.—Report on the Prospects of Cinchona Cultivation in India, by A. Wilson and T. Y. Mirchandani (2nd Edition).

No. 34.—Some Practical Results of Sugarcane Research in India.

No. 35.—Progress of Veterinary Research in India during the past 25 years, by F. Ware.

No. 36.—Milk Records of Cattle in Approved Dairy Farms in India, Vol. II, Part I—Cows, by K. P. R. Kartha.

No. 37.—Milk Records of Cattle in Approved Dairy Farms in India, Vol. II, Part II—Buffaloes by K. P. R. Kartha.

No. 39.—Studies in the Preservation of Fruit Juices, II, by Lal Singh and Girdhari Lal.

No. 40.—Grape growing in Baluchistan, by A. M. Mustafa and M. Asghar Genai.

A complete list of the publications of the I. C. A. R. is given in Appendix XV.

(iv) *Supply of publications.*—The following table shows the circulation figures for the Council's publications during the year under report:—

Name of periodical	Supplied as exchanges*	Sales		Distributed free
		Regular subscribers	Casual sales	
Agriculture and Livestock in India.	415	256	489 copies	201
Indian Farming . . .	415	648	100 ,,	201
Indian Journal of Agricultural Science.	321	147	684 ,,	103
Indian Journal of Veterinary Science and Animal Husbandry.	277	134	229 ,,	99
Scientific Monographs . .	..	..	144 ,,	33
Miscellaneous Bulletins . .	..	..	2,997 ,,	47

* Including those supplied as exchanges by the Directors, I. A. R. I., New Delhi and I. V. R. I., Mukteswar.

About 488 institutions in India and 248 abroad received one or more of the Council's publications either free or on exchange basis.

(v) *Editorial Committee and referees.*—The personnel of the Editorial Committee remained unchanged during the year. As in previous years the Editorial Committee was greatly assisted by a large number of honorary specialist referees in the examination of papers received for publication. The number of such referees during the year was 70 and the Council takes this opportunity of acknowledging the valuable services rendered by them.

CHAPTER IV.

LIBRARY

(i) *General.*—The Council maintains its own Library. It has a valuable collection of technical and scientific books and publications from all over the world. From a humble beginning with a small number of books and publications in 1930, the Library has been steadily growing and today it has on its lists a collection of no less than 35,000 books and publications on various subjects relating to agriculture and animal husbandry and on other allied subjects. The main source of supply of books, periodicals, etc., for the Library is through mutual exchanges with important scientific institutions in India and abroad. This brings in on an average about two to three thousand books and about three hundred journals annually. In addition, a sum of about Rs. 4,000 is spent annually from the Research funds of the Council on the purchase of new books and current periodicals.

At the close of the year the Library possessed 20,114 books, about 14,100 pamphlets and a large number of reprints and translations of foreign papers. A comparative statement of the material added during the last 10 years is given below:—

Year.	Books.	Pamphlets.	Periodicals.
1930	1,500	1,000	100
1931	4,000	2,000	140
1933	9,427	5,000	179
1934	11,259	6,000	226
1935	13,145	8,500	270
1936	14,708	10,000	286
1937	16,150	11,000	307
1938	18,730	12,000	380
1939	20,114	14,100	422

Accessions—Books and publications.—As many as 3,187 books and publications were acquired during the year under review as follows:—

(i) By Purchases	345
(ii) Through Exchanges	2,387
(iii) Bound Volumes of Journals	455

The details of the exchanges are given in Appendix XVI. As usual, the United States Department of Agriculture and its various Experimental Stations and Great Britain were most generous in the supply of their publications and special thanks of the Council are due to them.

Periodicals.—The number of current periodicals reached the total of 422 exclusive of serials and annuals. Of this number 124 are purchased from

the Research Funds of the Council, and the rest are received on exchange or gratis. A classified list of important periodicals received in the Library is at Appendix XVII.

Translations.—The translation service started by the Imperial Agricultural Bureaux is proving to be very useful. During the year fifty-three translations were received in the Library from the various bureaux, bringing the total number of such collections to 377. Of these 40 translations were lent out to research workers during the year.

(ii) *Functions of the Library.*—Besides the important task of steadily building up a valuable library there are three important functions which the Library of the Council has to perform. They are (*a*) Classification and Cataloguing, (*b*) Circulation of books and periodicals, and (*c*) maintenance of a reference service.

(*a*) *Classification and Cataloguing.*—The books are classified according to *Decimal Classification* and both printed as well as card catalogues are maintained. The half-yearly Supplement of the printed catalogue for January to June, 1939 is ready and will be available for distribution shortly. The Supplement for July to December, 1939, is in the Press. The Dictionary Card Catalogue has also been kept up-to-date and more than 3,000 typed cards have been added to it during the year. In addition to these catalogues a Shelf List on cards, arranged in the same order as books on the shelves, is kept for purposes of inventory.

(*b*) *Circulation.*—The circulation statistics show a marked increase in the use of the library. The recorded figure for loans of books and publications during the year reached 16,222. This includes 3,109 books and 13,113 issues of periodicals and exceeds the last year's figure by more than 5,000. This is the highest figure recorded so far. It does not, however, include the use of books in the Library Reading Room and the Officers' Sectional Libraries. The following analysis of the loan of books under various kinds of subjects may be of interest:—

1. Social and Economic Sciences	399
2. Pure Science	79
3. Medicine and Veterinary Science	91
4. Agriculture (General)	1,847
5. Agronomy, Crops, etc.	416
6. Animal Husbandry and dairying	143
7. Technology	31
8. Miscellaneous	103
Total	3,109

(*c*) *Reference.*—The most important function of the Library is to render reference service and bibliographical aid to the staff and research workers. This work involves a good deal of search and of study of scientific periodicals. It has lately become a regular feature of the activities of the library. Numerous inquiries about information on specific questions and requests for references to literature on particular subjects were received and complied with. To improve this service all the material received in the Library, including leaflets, reprints and small pamphlets, is carefully catalogued and indexed and a classified list of pamphlets incorporating entries up to the end of 1936 was issued in 1938. Its first supplement is now in preparation.

APPENDIX I.

IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

Governing Body.

1. The Honourable Sir Girja Shankar Bajpai, K.B.E., C.I.E., I.C.S., *Chairman.*
2. Mr. P. M. Kharegat, C.I.E., I.C.S., *Vice-Chairman.*
3. Mr. H. M. Hood, C.S.I., C.I.E., I.C.S., Second Adviser to H. E. the Governor of Madras, in charge of Agriculture.
4. Mr. H. F. Knight, C.I.E., I.C.S., Adviser to H. E. the Governor of Bombay, in charge of Agriculture.
5. The Hon'ble Minister for Agriculture, Bengal.
6. Mr. P. W. Marsh, C.S.I., C.I.E., I.C.S., Adviser to H. E. the Governor of the United Provinces, in charge of Agriculture.
7. The Hon'ble Minister for Development, Punjab.
8. Mr. E. R. J. R. Cousins. C.I.E., I.C.S., Adviser to H. E. the Governor of Bihar, in charge of Agriculture.
9. Sir Geoffry Burton, K.C.I.E., I.C.S., Financial Adviser to H. E. the Governor of the Central Provinces and Berar.
10. The Hon'ble Minister for Agriculture, Assam.
11. Sir Arthur Parsons, K.C.I.E., C.B.E., D.S.O., Adviser to H. E. the Governor of the North-West Frontier Province.
12. Mr. E. C. Ansorage, C.I.E., I.C.S., Adviser to H. E. the Governor of Orissa.
13. The Hon'ble Minister for Agriculture, Sind.
14. The Hon'ble Mr. Hosain Imam, Member, Council of State, Representative of the Council of State.
15. Pandit Sri Krishna Dutt Paliwal, M.L.A. } Representatives of the Legislative
16. Mohd. Azhar Ali, Esquire, M.L.A. } Assembly (Central).
17. Mr. R. Scherer, Representative of the Associated Chambers of Commerce of India.
18. Mr. Debi Prasad Khaitan, Representative of the Federation of Indian Chamber of Commerce and Industry.
19. Dr. B. K. Badami, Director of Veterinary Department, Government of Hyderabad. } Representatives of the Advisory Board of the I. C. of A. R.
20. Mr. D. R. Sethi, I.A.S., Director of Agriculture, Bihar. }
21. Joint Secretary to the Government of India, Education, Health and Lands Department.
22. The Revenue Member to the Government of Hyderabad.
23. The Member in-charge of Agriculture, Government of Mysore.
24. The Member in-charge of Agriculture, Government of Baroda.
25. The Diwan of Cochin.
26. The Diwan of Travancore.
27. The Revenue Member, Government of Bhopal.
28. The Development and Commerce Minister, Government of Jammu and Kashmir.
29. Diwan Bahadur Sir T. Vijayaraghavacharya, K.B.E.

Secretary, Imperial Council of Agricultural Research, *Secretary.*

Advisory Board.

1. Vice-Chairman, Imperial Council of Agricultural Research, *Chairman.*
2. Agricultural Commissioner with the Government of India.
3. Animal Husbandry Commissioner with the Government of India.
4. Agricultural Marketing Adviser to the Government of India.

5. Director, Imperial Agricultural Research Institute, New Delhi
6. Director, Imperial Veterinary Research Institute, Mukteswar.
7. Director, Indian Institute of Science, Bangalore.
8. Director of Agriculture, Madras.
9. Director of Agriculture, Bombay.
10. Director of Agriculture, Bengal.
11. Director of Agriculture, United Provinces.
12. Director of Agriculture, Punjab.
13. Director of Agriculture, Bihar.
14. Director of Agriculture, Central Provinces and Berar.
15. Director of Agriculture, Assam.
16. Agricultural Officer, North-West Frontier Province.
17. Director of Development, Orissa.
18. Director of Agriculture, Sind.
19. Mr. T. J. Hurley, M.R.C.V.S., Director of Veterinary Services, Madras.
20. Mr. E. S. Farbrother, M.R.C.V.S., I.V.S., Director of Veterinary Services, Bombay.
21. Mr. A. D. MacGregor, F.R.C.V.S., Veterinary Adviser to the Government of Bengal.
22. Mr. T. J. Egan, M.R.C.V.S., I.V.S., Director, Civil Veterinary Department, United Provinces.
23. Captain U. W. F. Walker, M.C., M.R.C.V.S., I.V.S., Director of Veterinary Services, Punjab.
24. Mr. M. I. Malik, Director of Veterinary Services, Bihar.
25. Rai Bahadur R. V. Pillai, Deputy Director of Veterinary Services, Central Provinces and Berar.
26. Rai Sahib S. C. Ghosh, G.B.V.S., Director of Veterinary Department, Assam.
27. Mr. S. M. Sarwar, Superintendent, Civil Veterinary Department, North-West Frontier Province.
28. Mr. J. H. G. Jerrom, M.R.C.V.S., I.V.S., Director of Veterinary Services, Sind.
29. Mr. A. M. Mustafa, Agricultural Officer in Baluchistan. (Representative of minor administrations).
30. Mr. L. Mason, C.I.E., O.B.E., M.C., I.F.S., Inspector General of Forests. (Representative of the Forest Research Institute).
31. Diwan Bahadur T. Raghaviah, C.S.I. (Representative of the Co-operative Movement).
32. Lt.-Col. E. Cotter, I.M.S., Public Health Commissioner with the Government of India. (Representing the Indian Research Fund Association).
33. Dr. Birbal Sahni, Sc.D. (Contab.), Lucknow University
34. Prof. C. N. Vakil, M.A., M.Sc., F.S.S., University Professor of Economics, Bombay University.
35. Khan Bahadur Mian M. Afzal Hussain, I.A.S., Vice-Chancellor, Punjab University.
36. Mr. N. S. Subba Rao, Vice-Chancellor, Mysore University.

Representatives of the Inter-University Board.

37. Mr. P. H. Carpenter. (Representative of the Indian Tea Association and the United Planters Association of Southern India).
38. Mr. H. Sitarama Reddy. (Representative of the Indian Central Cotton Committee).
39. Director of Agriculture, Hyderabad.
40. Director of Agriculture, Mysore.
41. Commissioner of Agriculture, Baroda.
42. Director of Agriculture, Cochin.

43. Director of Agriculture and Fisheries, Travancore.
44. Director of Agriculture and State Chemist, Bhopal.
45. Director of Agriculture, Kashmir.
46. Director of Veterinary Department, Hyderabad.
47. Superintendent. Civil Veterinary Department, Mysore.
48. Deputy Director of Veterinary and Animal Husbandry Science, Baroda.
49. Personal Veterinary Assistant to the Director of Agriculture, Cochin.
50. Revenue Secretary, Bhopal.
51. Superintendent, Civil Veterinary Department, Kashmir.
52. Lt.-Col. J. J. M. Souter, O.B.E., Director of Veterinary Services in India, Army Headquarters.
53. Mr. G T. Tait, Central Publicity Officer, Indian State Railways.
54. Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.), Director, Technological Laboratory, Indian Central Cotton Committee.
55. Sardar Bahadur Sir Datar Singh.
56. The Hon'ble Maulvi Sir Mohd. Yakub, Member, Council of State.
57. Sir Chunnilal V. Mehta, K.C.S.I.
58. Mr. E. F. G. Gilmore, Director, Industrial Research Bureau, Government Test House, Calcutta.
59. Raja Jagannath Baksh Singh, M.L.C. (U. P.).
60. Dr. T. E. Gregory, D.Sc., Economic Adviser to the Government of India.

The Secretary, Imperial Council of Agricultural Research, *Secretary*.

Secretariat Office of the Imperial Council of Agricultural Research.

Mr. P. M. Kharegat, C.I.E., I.C.S., Principal Adminsitrative Officer and Vice-Chairman.

Dr. W. Burns, C.I.E., D.Sc., Agricultural Commissioner with the Government of India.

Mr. F. Ware, C.I.E., F.R.C.V.S., I.V.S., Animal Husbandry Commissioner with the Government of India.

Mr. S. Basu. I.C.S., Secretary.

Rai Bahadur R. L. Sethi, M.Sc., B.Sc (Agri.) (Edin.), M.R.A.S., I.A.S., Assistant Agricultural Expert.

Mr. H. B. Shahi, M.Sc., M.R.C.V.S., D.T.V.M., Assistant Animal Husbandry Expert.

Khan Sahib Bazlul Karim, Superintendent. (On leave preparatory to retirement).

Mr. S. C. Sarkar, B.A., M.R.A.S., Superintendent. (General).

Mr. T. S. Krishnamurti, B.A., Superintendent. (Agriculture).

Heads of Subordinate Officers.

Mr. A. M. Livingstone, M.C., M.A., B.Sc., Agricultural Marketing Adviser to the Government of India.

Mr. R. C. Srivastava, O.B.E., B.Sc., Director, Imperial Institute of Sugar Technology.

Research Officers at Headquarters.

Rao Bahadur Y. Ramachandra Rao, M.A., F.E.S., Locust Research Entomologist.

Mr. S. S. Iyer, B.A., Statistician.

APPENDIX II

Summary of decisions taken by the Governing Body at their meeting held in July 1939

A.—General recommendations.

1. Financial position of the Imperial Council of Agricultural Research.

The Governing Body approved of the proposal to levy a cess on export of certain agricultural commodities, provided that the Central Government agree to continue to finance the marketing work at a cost of about 5 lakhs a year.

2. Reconstitution of Standing Committees appointed by the Governing Body of the Imperial Council of Agricultural Research.

The recommendations of the Advisory Board in regard to the reconstitution of the Sugar, Rice, Fodder and Grazing, Locust, Animal Nutrition, Cattle Breeding and Dairying Committees were *accepted* and a few additions were made in the personnel of some of the Committees.

3. Report on the prospects of Cinchona cultivation.

The recommendation of the Advisory Board that one of the workers already dealing with cinchona cultivation in India should be asked to draw up a suitable programme of work for 5 years in the first instance was *approved*, subject to the remark that two schemes should be drawn up, one for North India and one for the South, for the consideration of the Council.

4. Report on an enquiry into the cultivation of cloves in India.

The recommendation of the Advisory Board for conducting a set of co-operative clove planting experiments in Madras, Travancore, Mysore and Coorg was *approved*, in principle.

5. Holding of an all-India Sugar Conference to consider measures for the rationalisation of the Sugar Industry.

Recommendation *approved*.

6. Establishment of an all-India Sugar Committee on the lines of the Indian Central Cotton Committee.

Recommendation *approved* in principle.

The question as to how it should be constituted and financed and what exactly its function should be will be examined by a special Committee and the scheme formulated by them will be put up to the Governing Body for approval at a special meeting.

7. Recommendation that a few fully equipped first class stations should be established to concentrate fundamental and comprehensive research on sugar-cane and that other stations should be utilised for varietal trials only.

Approved.

8. Recommendation that a further note should be prepared by Mr. P. V. Isaac containing all available information on the biological control of sugar-cane pests all cover India.

Approved.

9. Recommendation of the Advisory Board for undertaking—

(*i*) Legislation for controlling the quality of exports of unmanufactured tobacco.

(*ii*) Legislation for the licensing of barns and for the adoption of other measures of control on the lines of the Mysore Cigarette Tobacco safeguarding Act in new areas where the cultivation of virginia tobacco may be introduced.

(*iii*) Legislation for the establishment of regulated markets and open auction floors for the sale of graded tobacco.

The following resolutions were passed by the Governing Body on the recommendations of the Advisory Board :—

(*i*) The Governing Body recommends to the Central Government that it should enact legislation at an early date for the grading of all exports of unmanufactured tobacco and controlling the quality of such exports;

(*ii*) The Governing Body recommends to Provincial and State Governments that they should enact legislation for the licensing of barns and for the adoption of other measures of control in new areas where the cultivation of Virginia Tobacco may be introduced;

(*iii*) The Governing Body recommends to the Provincial and State Governments that they should enact legislation for the establishment of regular markets for the sale of graded tobacco, if this has not been done already.

10. Need for Provincial Fertilizers Acts.

The Governing Body recommended to the Central Government that action should be taken under Section 103 of the Government of India Act, 1935, to prevent the sale of adulterated fertilizers in India.

11. Control of rusts of wheat in India.

The Governing Body *approved* that—

(*i*) The Government of Madras may be requested to suspend the April-June Wheat Crop in the Nilgiris and Palni Hills, experimentally to see, in a limited area, the results of the methods advocated by Dr. K. C. Mehtra for the control of wheat rusts in India and to put up a concrete scheme for the purpose; and

(*ii*) Experiments be conducted in Kulu Valley in order to test the effect of clean-up of all out-of-season wheat plants.

12. Note on the position in regard to wheat production in India.

Recorded.

13. Recommendations of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry.

The recommendations of the Advisory Board for carrying out a soil survey and preparing a soil-map of India were *approved of in principle*. It was decided that a suitable scheme should be put up to implement them in consultation with the Provinces and States Governments.

14. Setting up a Standing Committee for Crop-planning.

The recommendation of the Advisory Board was approved.

15. Publication of progress reports of current schemes.

The recommendations of the Advisory Board that the Directors of Agriculture might be authorised to utilise the material in progress report of the Council's schemes and that copies of the progress reports should be sent to technical workers and factories after they had been passed by the Advisory Board making it clear that the results of the experiments were still incomplete, that abstracts should be published from time to time and that the final reports should be saleable publications were *approved*.

16. Model Projects.

The recommendation that, with a view to translate the results of research into practice, Provinces and States should be requested to put up schemes of model projects on cultivators' holdings in homogenous agricultural tracts was *accepted*.

17. Extension of Fruit Research Schemes—General principles.

The Governing Body *accepted* the recommendation that after the first period of 5 years, one-third of the recurring expenditure during the next five years should be borne by the Provincial Government and two-thirds by the Council and the half and half basis of sharing expenditure should be applied in case of further extension after the second period of five years and that non-recurring expenditure involved in extensions should be borne by Provincial Governments.

18. Report on an enquiry into the Agricultural and Veterinary needs of Coorg.

The report was approved as also the proposal for its publication as an unpriced publication.

19. Brochure Defining the Breed characteristics of 7 Breeds of Milch Cattle.

Recorded.

20. Regularising excess expenditure incurred on the travelling allowance of 'visitors' during 1936-37 and 1937-38.

The Governing Body sanctioned the excess expenditure amounting to Rs. 10,471 incurred on the travelling allowance of visitors during 1936-37 and 1937-38.

21. Details of expenditure incurred from the Miscellaneous Grant of Rs. 2,000 from the Council's budget during 1936-37, 1937-38 and 1938-39.

Recorded.

B.—RESEARCH SCHEMES

No.	From whom received.	Nature of scheme.	Period in years.	Amount asked for.	Recommendation of the Advisory Board.			Decision of the Governing Body.		
					Grant by the Imperial Council of Agricultural Research.	Period in years.	Remarks.	Grant by the Imperial Council of Agricultural Research. (Sanctioned).	Period.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
				Rs.	Rs.			Rs.	Yrs. Mths.	
	A.—SUGAR SCHEMES.	NEW SCHEMES.								
1	United Provinces .	Survey of yield and Gur : Cane ratio.	3	50,000	50,000	3	...	50,000	3 0	Subject to amount being available from special grant.
2	Bihar . . .	Statistical Assistant at the Sugarcane Research Station, Pusa.	2/3	1,450	1,450	2/3	...	1,470	Upto 17th Mar. 40.	Do.
3	Bihar . . .	Deputation of Mr. L. K. Khanna to Rothamsted.	2	8,000	8,000	2	...	8,000	2 0	Study leave.
4	Imperial Institute of Sugar Technology.	Manufacture of Sugar Candy.	3	18,560	18,560	3	...	18,560	3 0	Subject to amount being available from special grant.
	B.—AGRICULTURAL SCHEMES.									
5	Baroda . . .	Paddy Research .	5	23,125	23,125	5	...	13,800	3 0	
6	Travancore . .	Improvement of Paddy	5	25,920	25,920	5	...	15,600	3 0	
7	Central Provinces .	Breeding wheat suited to black soil area.	5	49,370	49,370	5	...	15,000	3 0	Balance to be met by Central Provinces Government.

B.—RESEARCH SCHEMES—*contd.*

No.	From whom received.	Naturof scheme.	eriod in years.	Amount asked for.	Recommendation of the Advisory Board.			Decision of the Governing Body.		
					Grant by the Imperial Council of Agricultural Research.	Period in years.	Remarks.	Grant by the Imperial Council of Agricultural Research. (Sanctioned).	Period.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
	B.—AGRICULTURAL SCHEMES—*contd.*			Rs.	Rs.			Rs.	Yrs. Mths.	
8	Baroda . . .	Pasture Lands .	5	1,93,088	59,699	5	Total cost revised to 1,21,486.	...	...	Consideration of Scheme postponed.
9	Travancore . .	Rice swarming caterpillar pest.	3	6,456	...	...	Not recommended	...	...	Scheme not approved
10	Indian Institute of Science, Bangalore.	Chemical oxidisers and fertilisers.	3	18,840	...	...	Do. .	...	...	Do.
11	Bihar . . .	Nutrition content of soils.	3	13,708	...	...	Do. .	...	...	Do.
12	Sind . .	Sub-surface investigation, Lloyd Barrage.	5	53,600	26,800	5	...	25,200	3 0	
13	Bhopal . . .	Pedological study of black cotton soils.	5	39,940	19,970	5	...	12,000	3 0	
14	Sind . . .	Alternate crops of cotton and wheat.	5	56,614	...	...	Not recommended	...	...	Scheme not approved.
15	Punjab . . .	Cereal Technologist for wheat research work.	5	32,760	16,380	5	...	...	...	Consideration of scheme postponed.
16	Madras . . .	Research work on potatoes.	5	13,750	13,750	5	...	...	...	Do.
17	Punjab . . .	Alkaloid contents in medicinal plants.	4	21,924	...	...	Not recommended	...	...	Scheme not approved.

18	*Madras* . . .	Tapping underground water.	...	9,110	...	...	Do. .	...	...		Do.
19	Imperial Agricultural Research Institute.	Development of certain lines of research.	5	2,50,000	2,50,000	5	...	2,50,000	5	0	Rs. 50,000 allotted for work in 1940-41.
20	Professor Mahalanobis .	Preparation of tables .	...	2,000	2,000	...	...	2,000	...		
	C.—Animal Husbandry Schemes.										
21	North-West Frontier Province.	Poultry diseases .	5	12,172	10,600	5	Total cost revised to Rs. 21,200.	6,300	3	0	
22	Bombay . . .	Do. . . .	5	30,028	16,600	5	Do. .	6,300	3	0	
23	Orissa . . .	Do. . . .	5	8,700	10,600	5	Do. .	...	...		Not approved.
24	United Provinces .	Do. . . .	...	9,620	10,600	5	Do. .	6,300	3	0	
25	Madras . . .	Do. . . .	3	6,300	10,600	5	Do. .	6,300	3	0	
26	Bihar . . .	Do. . . .	5	9,330	10,600	5	Do. .	6,300	3	0	
27	Several Provinces .	Bee-keeping Schemes—									
		(*a*) Expert and a central Station.	...	...	62,000	5	Schemes—as revised by the Advisory Board.	...	...		Consideration postponed.
		(*b*) Wyanaad Station .	...	...	12,000	5					
28	Kashmir . . .	Sheep breeding . .	6	36,000	23,120	6		11,700	3	0	Do.
29	Punjab . . .	Herd Books of the Hariana Breed.	5	34,045	13,482	3	...	13,422	3	0	
30	Imperial Veterinary Research Institute.	Life history of helminth parasites.	5	34,500	41,700	5	...	...	...		Do.
31	Dr. Moghe (Nagpur) .	Helminthological research.	1	2,900	5,600	2	...	5,000	2	0	
32	Imperial Veterinary Research Institute.	Cattle feed from molasses.	5	56,965	54,965	5	...	...	...		Approved administratively.
33	Madras . . .	Diseases caused by Anascrobes.	5	94,632	94,632	5	...	...	...		Consideration postponed.
34	Orissa . . .	Chilka Lake Fishery .	2	41,850	41,850	2	This is half the estimated cost of the scheme. The other half will be met by the province.	21,000	1	0	Scheme approved administratively for 2 years at Rs. 41,850.

13 4 2 8 8

B.—RESEARCHSCHEMES—*contd.*

No.	From whom received.	Nature of scheme.	Period in years.	Amount asked for.	Recommendation of the Advisory Board.			Decision of the Governing Body.		
					Grant by the Imperial Council of Agricultural Research.	Period in years.	Remarks.	Grant by the Imperial Council of Agricultural Research. (Sanctioned).	Period.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
	C.—ANIMAL HUSBANDARY SCHEMES—*contd.*			Rs.	Rs.			Rs.	Yrs. Mths.	
35	Imperial Council of Agricultural Research.	Survey of helminth infection (3 centres).	...	24,400	18,300	2	Total cost revised to Rs. 18,300.	18,300		
36	Do. . .	Grey breeds of cattle .	½	34,000	29,400	½	Total cost revised to Rs. 29,400.	...	..	Consideration postponed.
36A	Agricultural Marketing Adviser to the Government of India.	Mechanical flaying of hides in India.	...	...	...	...	...	1,300	0 6	The balance of Rs. 600 will be met from the hide Improvement Fund.
	D.—MISCELLANEOUS.									
37	Indian Society of Soil Science.	Grant-in-aid . .	5	3,750	3,750	5	...	2,250	3 0	
38	Indian Council of Agricultural Research.	Critical Monograph on Dry Farming.	1	5,700	5,700	1	...	5,700	1 0	
39	Indian Statistical Institute.	Professor Letelling's visit to India.	...	3,000	...	...	Not recommended	...	...	Scheme not approved.
40	Imperial Council of Agricultural Research.	Affiliation of the Imperial Council of Agricultural Research with International Dairy Federation.	5	500	500	...	...	500	...	
41	Imperial Council of Agricultural Research	Publications of abstracts of selected articles from foreign journals.	5	2,775	2,755	5	...	1,500	3 0	
			...		...	...		..	..	

	A.—Sugar Schemes.	Existing Schemes—Renewals and Additions.									
42	Bombay . . .	Sugarcane research .	2	82,700	82,700	2	...	82,700	2	0	Subject to the amount being available from the grant for Sugar Research.
43	Madras . . .	Morphology and Anatomy of sugarcane sorghum hybrids.	1	3,166	...	...	Not recommended	...	...		Not approved.
	B.—Agricultural Schemes.										
44	Dacca University .	Lateritic and red Soils of India.	5	25,938	25,938	5	...	9,100	1	9	
45	Dacca University .	Nutrition of the Rice Plant.	5	38,228	37,028	5	...	12,950	1	9	
46	Assam . . .	Research in deep water paddy.	4¼	94,200	26,214	3	...	...	...		Extended upto 31st March 1940.
47	Bihar . . .	Rice Research Scheme	2	64,496	6,225	1/6	...	3,100	0	2½	
48	Dacca University .	Organic constituents of Indian soils.	2	2,400	2,400	2	...	2,300	1	11	
49	Indian Institute of Science, Bangalore.	Quality of crops .	3	12,150	...	...	Not recommended	...	...		Not approved.
50	Dr. N. R. Dhar . .	Nitrogen fixation .	3	11,310	...	...	Do.	...	...		Do.
51	United Provinces .	Brewing qualities of barleys.	5	14,000	14,400	5	...	5,800	2	0	
52	Punjab . . .	San Jose Scale survey	1	25,000	25,000	1	...	14,580	0	7	
53	Bombay . . .	Cold Storage scheme .	3	59,217	59,217	3	...	41,040	2	1	
54	(*a*) Madras . .	Dry Farming Scheme	2	58,994	56,586	3½	...	32,400	2	0	
54	(*b*) Bombay . .	Do. .	3½	1,25,499	1,25,499	3½	...	71,800	2	0	
54	(*c*) Punjab . .	Do. .	5	1,37,204	70,507	3½	...	35,350	1	9	
54	(*d*) Hyderabad . .	Do. .	3½	43,869	32,397	3½	...	18,400	2	0	
55	Hyderabad . .	Castor Improvement .	5	32,068	32,068	5	...	13,866	2	2	
56	Bihar . . .	Fruit Research . .	3	48,867	32,578	3	...	21,600	2	0	
57	United Provinces .	Do.	5	1,37,200	1,20,213		...	42,000	1		

B.—RESEARCH SCHEMES—*concld.*

No.	From whom received.	Nature of scheme.	Period in years.	Amount asked for.	Recommendation of the Advisory Board.			Decision of the Governing Body.		
					Grant by the Imperial Council of Agricultural Research.	Period in years.	Remarks.	Grant by the Imperial Council of Agricultural Research. (Sanctioned).	Period.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
	B.—AGRICULTURAL SCHEMES—*contd.*			Rs.	Rs.			Rs.	Yrs. Mths.	
58	Madras . . .	Fruit Research	5	85,000	53,700	5	...	18,100	2 1	
58*a*	Baluchistan . .	Fruit canning (additional grant).	...	...	3,000	...	Non-recurring .	3,000	...	
58*b*	...	Termination of Central Provinces Citrus Research Scheme.	...	...	...	...	...	...	...	Decided to continue the scheme for a year more.
59	Travancore . .	Coconut palm diseases	3	35,184	23,300	2	...	23,200	2 0	Question of contribution of half the cost by the State to be considered after the expiry of two years.
60	Mr. Boshi Sen . .	Plant Physiology scheme.	...	3,000	...	...	...	3,000	...	The amount to be met from the general savings.
	C.—ANIMAL HUSBANDRY SCHEMES.									
61	All Provinces and Hyderabad.	Veterinary Investigation Officers.	...	...	5,20,000	5	(Approximate cost)	1,04,000	1 0	
62	Madras . . .	Animal Nutrition Scheme.	3	30,270	30,270	3	...	20,000	2 0	

	D.—MISCELLANEOUS.										
63	Imperial Council of Agricultural Research.	Statistical Section (Supplementary Grant).	...	17,500	...	...	...	17,500	Upto November 1940.		
64	Imperial Council of Agricultural Research.	Statistical Section Extension).	5	1,12,320	1,12,320	5	...	7,500	0	4	
65	Orissa . . .	Marketing Staff (additional grant).	5	93,425	9,700	1	...	9,700	0	9	
66	Imperial Council of Agricultural Research.	Review of Research activities of the Imperial Council of Agricultural Research.	...	6,000	...	...	...	6,000	...		
67	Do. .	Locust Research Scheme.	...	15,500	...	...	...	15,500	...		Continuance of the Locust Research Entomologist and a skeleton staff upto the 31st December, 1940 .
67A	Do. .	Do. .	...	9,000	...	...	...	9,000	...		As expenditure in excess of the grant for the locust research scheme during 1938-39.
68	Do. .	Do. .	...	600	...	...	...	600	...		For retention of the post of clerk at the headquarters of the I. C. A. R. for locust work.
69	Do. .	Subscription to the Tobacco Federation of the British Empire.	...	135	...	...	...	135	...		
70	Do. .	Cold Storage . .	2	9,800	...	...	...	9,800		2	

NOTE.—Funds were also allotted to the following schemes which had already been approved and which have been awaiting the allocation of funds :—

	Rs.	Period.
1. Kashmir Rice Research Scheme	9,300	3 years.
2. Research on papay breeding and cultural practices.	6,000	3 ,,
3. Training of an officer at Aberystwyth in methods of grassland improvement . .	8,000	2 ,,
4. Mysore sheep-breeding scheme	7,200	3 ,,
5. Bombay wool analysis scheme	15,300	3 ,,
6. Mysore Poultry Diseases scheme	14,700	3 ,,

APPENDIX III.

Summary of important recommendations made by the Advisory Board at its meetings held in May 1939 and November—December 1939.

I—May 1939.

Item No. of the agenda.	Subject.	Brief recommendation.
6(1)	Extension of the Madras Fruit Research Scheme beyond the 1st March, 1940.	Extension for 5 years recommended, subject to certain suggestions.
6(2)	Extension of the United Provinces Hill Fruit Research Scheme, Chaubattia, beyond the 9th July, 1940.	Extension in principle recommended, subject to certain remarks and suggestions.
6(3)	Extension of the Bihar and United Provinces Plains Fruit Research Scheme, Sabour, beyond 1940.	Ditto.
6(4)	Extension of the Bombay Coal Storage Scheme—beyond 1st March, 1940.	The Advisory Board approved of the extension of the scheme for a period of three years. The whole cost of the scheme was recommended to be borne by the Council.
9(1)	Extension of the Rice Research Scheme, Bihar, beyond 1940.	The Board recommended the extension of the scheme till the 31st March 1940.
9(2)	Extension of the scheme on 'Quality in crops' with special reference to rice (Indian Institute of Science, Bangalore), beyond 1939.	The Board did not recommend the extension asked for.
11(1)	Extension of the research on the organic constituents of Indian soils at Dacca University by Dr. J. C. Ghosh at a cost of Rs. 2,400 spread over two years.	An extension for 2 years at a cost of Rs. 2,400 to the Council was recommended by the Board.
11(2)	Extension of the Dacca University scheme of research on the nutrition of the rice plant with special reference to the nitrogen supply (Rs. 38,228 spread over five years from 1st July 1940.)	An extension for 5 years was recommended by the Board at a cost of Rs. 37,028 to the Council.
11(3)	Extension of the Dacca University scheme of research on the lateritic and red soils of India. (Rs. 25,938 spread over five years from 1st July 1940).	The Board recommended an extension for 5 years at a cost of Rs. 25,938.
11(4)	Extension of Dr. Dhar's scheme of research on nitrogen loss and nitrogen fixation in soils, (Rs. 11,310 for three years from 1st August 1940).	The Board did not recommend the extension of the scheme.

Item No. of the agenda.	Subject.	Brief recommendation.
12(1)	Application from the Director, Indian Institute of Science, Bangalore, for a grant of Rs. 18,840 spread over three years for a scheme of investigation on chemical oxidisers as fertilisers.	The Board did not recommend the scheme and suggested that the effect of manganese on plants might be studied first.
12(2)	Application from the Government of Bihar for Rs. 13,708 spread over three years for the determination of the nutrient content of Indian soils.	The Board did not recommend the scheme.
12(3)	Application from the Government of Sind for a grant of Rs. 4,45,670 spread over five years for subsurface investigation work in the Lloyd Barrage area in Sind.	The Board recommended a grant of Rs. 26,800 spread over 5 years.
12(4)	Application from the Government of Bhopal for a grant of Rs. 39,940 spread over a period of five years for a scheme of research for the classification and pedological study of black cotton and other soils.	The Board recommended a grant of Rs. 19,970 spread over 5 years.
13(1)	Recommendations of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India (first meeting) regarding— (*a*) organisation of an all-India soil survey, and (*b*) appointment of a committee to define methods of soil analysis.	The Board endorsed the recommendations made in this behalf by the Soil Science Committee.
14(1), (2),(3) and (4).	Extension beyond 1st April of the Dry Farming Research Schemes in Madras, Bombay, Punjab and Hyderabad.	The Board— (1) recommended the extensions of the schemes till 30th September 1943 as suggested by the Dry Farming Research Committee at the cost mentioned by it, for each. (2) recommended that with a view to translate the results of research into the cultivator's practice, provinces and states be requested to put up schemes of model projects on cultivator's holdings in homogeneous agricultural tracts the expenditure to be equally divided between the provinces and States and the Imperial Council of Agricultural Research. In the case of schemes where work is proposed

Item No. of the agenda.	Subject.	Brief recommendation.
		to be done on cotton the Indian Central Cotton Committee should be requested to bear half the proportion of the cost to be borne by the Imperial Council of Agricultural Research. (3) suggested that it might be pointed out to Provincial Governments and States that the carrying out of these model projects was at least at the present stage essentially a matter of developmental research.
14-A	Scheme for writing up of a critical monograph on Dry Farming Research work in India.	The Board recommended an expenditure of Rs. 5,700 for preparing the monograph and suggested that the Bombay Government might be asked to agree to the grant of the honorarium to Mr. Kanitkar as proposed.
16(1)	Extension of the U. P. scheme of investigation into the malting and brewing qualities of the United Provinces Barleys at a cost of of Rs. 13,000 spread over five years.	The extension was recommended by the Board at a cost to the Council of Rs. 13,000 spread over five years.
16(2)	Extension of the potato research scheme in Madras at a cost of Rs. 24,456 spread over five years.	The Board recommended the revised scheme for sanction at a cost of Rs. 13,750 to the Council spread over five years.
16(3)	Extension of the All-India Castor Improvement Scheme, Hyderabad, for a period of five years at a cost of Rs. 32,068.	An extension for a period of five years at a cost of Rs. 32,068 to the Council was recommended by the Board.
17(1)	Application from the Government of Orissa for a grant of Rs. 4,701 spread over three years for a scheme of research on turmeric.	Consideration postponed.
17 (2)	Application from Dr. H. Chaudhri through the Government of the Punjab for a grant of Rs. 21,924 spread over four years for the study of the effect of nutrients and other factors of alkaloidal content in certain medicinal plants.	The Board did not recommend the scheme.
17 (3)	Application from the Annamalai University for a grant of Rs. 8,520 spread over three years for a scheme of research into the cytogenetics of Capsicum.	The Board did not recommend the scheme.

tem No. of the agen-da.	Subject.	Brief recommendation.
17 (4) and (5)	Application from the Annamalai University for a grant of Rs. 3,630 spread over three years for research on the protein of Indian pulses. Application from the Government of the United Provinces for a grant of Rs. 23,380 spread over five years for chemical research on the oil contents and the formation and chemical composition of oil in oil seed crops.	Consideration postponed.
20 (4)	Note from the Government of the Punjab regarding the necessity for appointing a cereal technologist for wheat work in India (Rs. 32,760 spread over five years).	The Advisory Board recommended the scheme subject to the following conditions, *viz.*, (*a*) that half the cost of the scheme should be borne by the Punjab Government and (*b*) that to attract suitable and qualified candidates, it should be provided that a higher initial salary within the proposed scale might be offered according to qualifications.
24	Extension of the combined San Jose Scale Survey in the Punjab and North-West Frontier Province for one year at a cost of Rs. 25,000.	The Board recommended the extension for one year at a cost of Rs. 25,000 to the Council.
24-A	Extension of the scheme of research on the diseases of the coconut palm in South India, Travancore, for a period of three years at a cost of Rs. 35,184.	The Board recommended an extension for two years at a cost of Rs. 23,300 to the Council.
25	Revised scheme for the investigation of necrosis (black tip) of the mango (fruit, by Dr. S. N. Das of the Lucknow University).	Consideration postponed.
26 (1)	(*i*) Application from the Director, Gokhale Institute of Economics and Politics, Poona, for a grant of Rs. 21,500 spread over four years for extension of the Scheme of Research on Agricultural Economics.	Consideration postponed pending receipt of the report on farm management survey promised by Mr. Gadgill.
26 (2)	Application from the Director, Imperial Agricultural Research Institute, New Delhi, for a grant of Rs. 2,50,000 for a scheme for the development of certain lines of research at the Institute.	The Board approved the programme of work as recommended by the Committees on the understanding that the question relating to quality of crops will be further examined by a sub-committee consisting of Col. Cotter, Dr. Burns, Rao Bahadur Viswanath and Mr. Livingstone and a note on the sampling technique would be put up before the next meeting of the Board and that the staff should work as a

Item No. of the agenda.	Subject.	Brief recommendation.
		complete whole and should not be restricted to work in the branch in which they are appointed. Subject to this it recommended the scheme be sanctioned with the proviso that it should be pointed out to the Government of India that the allotment for travelling allowance in the budget of the Institute was insufficient and it should be requested to increase the same; and in the meantime efforts should be made as as far as possible, to cut down the expenditure on other items and provide more money for the travelling allowance of the officers of the Institute, so as to enable them to visit the provinces and give adequate help and guidance to them.
26 (3)	Application from Professor P. C. Mahalanobis, Presidency College, Calcutta for a grant of Rs. 2,000 for one year for the preparation of tables for the studentized form of D^2 statistics.	The Board recommended the grant.
30 (1)	Extension of the Sugarcane Research Scheme in Bombay-Deccan, Padegaon. (Cost Rs. 32,700 spread over 2 years from the 6th June, 1940 to 31st May, 1942).	The Advisory Board recommended that the scheme be extended as proposed and that the whole situation in respect of sugarcane research may be reviewed in the light of the recommendations made for the establishment of first class stations.
30 (2)	Extension of the scheme for research on Morphology and Anatomy of Sugarcane-Sorghum hybrids by Dr. T. Ekambaram of the Madras University. (Cost Rs. 3,166 for 1 year from the 16th March, 1940).	The Advisory Board recommended that the scheme be not extended as its usefulness was problematical.
31 (1)	Scheme for the establishment of a sugarcane seedling testing substation at Cuttack, Orissa. (Cost Rs. 20,000 spread over five years).	Scheme not considerded.
31 (2)	Scheme for the survey of the yield and gur : cane ratio of sugarcane in the United Provinces and for the investigation of crop sampling technique at a cost not exceeding Rs. 7,01,634 for a period of three years.	The Board recommended the scheme at a cost of Rs. 50,000 to the Council spread over a period of three years, on the understanding that the Provincial Government were financing a similar scheme in respect of wheat.
31 (3)	Scheme for survey of the yield of gur : cane ratio of sugarcane in Assam and for the investigation of crop sampling technique. (Cost Rs. 3,322 for 6 months.)	The Advisory Board recommended that the consideration of this scheme should be postponed till after the results of the investigations recommended in the United Provinces are known.

Item No. of the agenda.	Subject.	Brief recommendation.
31 (4)	Provision for the post of the Statistical Assistant at the Sugarcane Research Station at Pusa. (Cost Rs. 1,450 from 1st June, 1939 to 17th March, 1940).	The Advisory Board recommended that the proposal be approved with the proviso that the entertainment of a statistician was not to be regarded as a precedent by other stations.
31 (5)	Application of Mr. K. L. Khanna, Sugarcane Specialist under the Bihar Sugarcane Research Scheme, for the deputation to Rothamsted.	The Advisory Board recommended that Mr. Khanna be sent to England for study in the statistical and crop physiological departments at Rothamsted as recommended by Sir John Russell the terms to be offered to him being left to the decision of the Imperial Council of Agricultural Research, but it was suggested that definite rules should be laid down to cover such cases.
31 (6)	Scheme for research in the manufacture of sugar candy by the Director, Imperial Institute of Sugar Technology. (Cost Rs. 18,561 spread over three years.)	The Advisory Board recommended that this is a useful scheme of all-India importance and should be sanctioned and that the Director, Imperial Institute of Sugar Technology, should send in a scheme for starting a section for research on confectionery and other subsidiary products at the Institute.
32-A	Consideration of the Report of the Indian Tariff Board on the Sugar Industry.	The Advisory Board made the following recommendations arising from its consideration of the report of the Indian Tariff Board on the Sugar Industry :— (1) There should be more research work on the agricultural side, particularly on insect pests and diseases for improvement of sucrose content, resistance to frost, removing pithiness and ascertaining the fibre content of the crop. Whenever possible, these investigations should also be carried out on private farms where owners of such farms are agreeable. (2) Continuous trials of new varieties are essential and for this purpose (*a*) the number of testing stations should be increased and (*b*) an improved system of trials in experimental plots both in cultivators' fields and in factory farms should be devised. This may be done generally on the lines adopted in Bihar as explained by the Director of Agriculture, Bihar, in the meeting of the Sugar Committee. (3) An All-India Conference should be convened as recommended by the Tariff Board on which both factories and growers should be

Item No. of the agenda.	Subject.	Brief recommendation.
		suitably represented and a sub-committee of representatives of Sugar Manufacturers' Association, the Sugar Syndicate, etc., should put up concrete suggestions for the consideration of the Conference. The following questions may be referred to this Conference :— (a) Regulation of the production of cane. (b) Premium payments for better cane. (c) Legislation for zoning and licensing of factories and the appointment of controlling bodies. (d) The possibility of establishing industries subsidiary to sugar (Mr. Srivastava was asked to put up a note on this subject). (e) The question of rationalising the industry under some form of State control and of establishment of a Central Marketing Organisation. (f) Examination of the possibility of the export of Sugar after the lapse of the present sugar agreement. (4) An All-India Sugar Committee on the lines of the Indian Central Cotton Committee should be set up and that concrete proposals for its constitution should be put up at an early date. (5) Factories should be assigned suitable zones where necessary and in these zones steps should be taken to improve the roads and to avoid employing purchasing agents. (6) Suitable recommendations should be made to the Railway Board to adjust the freight rates on cane on the different Railway systems, to reduce the freight on lime and limestone for all sugar factories and to charge a combined rate in cases in which sugarcane have to be carried on more than one system of railways. (7) The research on technical processes of manufacture should be continued and the scope of the work of the Institute of Sugar Technology should include sugar candy, confectionery and other industries subsidiary to sugar.

Item No. of the agenda.	Subject.	Brief recommendation.
		(8) Factories should be asked to employ fully qualified men on adequate salaries and give them a suitable retaining fee during the off season. (9) The study of the comparative nutritive value of sugar and gur should be followed up by actual experimentations of feeding by nutrition experts. (10) The attention of the Government of India be invited to the Sugar Committee's resolution on power alcohol passed in May 1937 in view of the recommendations of the Tariff Board on the subject.
34	Continuance of the Veterinary Investigation Officer's scheme in the Provinces (except Sind) and Hyderabad State.	The Advisory Board recommended the extension of the posts of the Veterinary Investigation Officers accordingly at an approximate cost of Rs. 5,00,000 to the Council for a period of 5 years.
35 (1)	Application from the Government of Bihar for a grant of Rs. 9,330 for investigation of diseases of poultry.	The Advisory Board recommended that the scheme be sanctioned at a cost of Rs. 10,600 to the Council for a period of five years.
35 (2)	Scheme for the appointment of a special officer for the investigation of diseases caused by anaerobes.	The Board recommended that the scheme be sanctioned for a period of five years at a cost of Rs. 94,632 to the Council.
35 (3)	Scheme for the appointment of an officer in Madras to investigate diseases of poultry.	The Board recommended that the scheme as revised be sanctioned at a cost of Rs. 10,700 to the Council for a period of five years.
35 (4)	Application from the Government of Baroda for a grant of Rs. 16,534 spread over a period of 5 years for a scheme for research into the diseases of poultry.	The Board recommended that the scheme should be revised on the lines approved by the Advisory Board.
37-A	Extension of the scheme of work on Animal Nutrition in Madras for a period of 3 years, with effect from the 1st April 1940 at a total cost of Rs. 30,270.	The Advisory Board recommended the extension subject to certain remarks.
38 (2)	Grey breeds—Definition of breed characteristics.	The Advisory Board recommended the scheme with some modifications, agreed to the inclusion of the Deoni breed amongst those breeds which should be convened in the ordinary way and recommended that the selection of officers should be left to the Imperial Council of Agricultural Research.

Item No. of the agenda.	Subject.	Brief recommendation.
38 (3)	Application from the Government of N.-W. F. P. for a grant of Rs. 37,500 for a scheme of sheep breeding with a view to the grading up of sheep for Karakul Pelt Production.	The Advisory Board decided to refer the case back to the Provincial Government.
38 (4)	Scheme for the improvement of indigenous breeds of horses in Bihar.	The scheme was not received in time for consideration at the meeting of the Advisory Board and was therefore postponed.
38 (5)	Scheme from the Government of Bengal for the improvement of Bhutia ponies of the hill districts of Bengal.	The Advisory Board decided to refer the case back to the Provincial Government.
38 (6)	Scheme submitted by the Government of Assam for the improvement of the Manipur breed of ponies.	The Board decided to refer the case back to the Provincial Government for reconsideration.
40	Application from Dr. B. K. Singh for a grant of Rs. 8,400 spread over 3 years for a scheme of research on dahi.	The Advisory Board decided to refer back the case for obtaining information on these points. It was noted that it should be possible to have the opinion of the newly appointed Dairy Director on this scheme before it again came up to the Board.
43	Survey of the incidence of Helminth infection in India.	The Board recommended that the additional staff asked for at the other three centres, *viz.*, Imperial Veterinary Research Institute, Mukteswar, Nagpur University, and Lucknow University. should be sanctioned. The total cost to the Council on this account would now be Rs. 18,300 spread over a period of 2 years.
45	Application from the Government of Orissa for a grant of Rs. 41,850 for carrying out biological investigations in the Chilka Lake Fishery.	The Board recommended the scheme for sanction subject to certain conditions.
46 (4)	Application from the Government of Orissa for a grant of Rs. 93,425 for a period of five years for additional agricultural marketing staff.	The Board recommended a grant of Rs. 9,700 to Orissa.
46-A (Supplementary).	Continuance of the Marketing work after 31st March, 1940.	The Board resolved that the Central Government should be requested to continue its grants for marketing work both at the centre and in the provinces for another period of five years; that additional provision should be made for one Assistant Marketing Officer in

Item No. of the agenda.	Subject.	Brief recommendation.
		each province to look after developmental work and that its decision be communicated to the provinces by the end of August to enable Provincial Governments to make necessary provision accordingly in their budgets. It was also resolved that the Provincial Governments should be requested to increase their contributions for marketing work, and in particular, they should take up the various items in connection with grading stations, etc.
48	Application from the Indian Statistical Institute for a special non-recurring grant of Rs. 3,000 towards the expenses of Professor Harold Hotelling's proposed visit to India.	The Board recommended that the application should be refused, as Prof. Hotelling's visit may not be useful to the Council.
50	Scheme in connection with the publication in the Indian Journal of Veterinary Science and Animal Husbandry of abstracts of selected articles from foreign journals.	The Advisory Board recommended the scheme for sanction at a cost of Rs. 2,775 for 5 years, at an average rate of 37 abstracts per annum at Rs. 15 each.

II—November—December 1939.

3	Security of tenure for the research staff of the Imperial Council of Agricultural Research.	The Board agreed that if finances permitted, Provident Fund benefit should be given to all the employees of the Imperial Council of Agricultural Research. As for increments it was suggested that the Council should, first ascertain the views of the Provincial Governments on the question of increments and exactly what their present practices were, which, it seemed, were different in different Provinces. As regards the possibility of making the staff permanent, a start could be made by maintaining a register of all suitable persons thrown out of employment by the termination of particular schemes and their names could be considered when a new scheme was sanctioned. If any of them was suitable, he should be recommended for employment under another scheme. The Council should also explore the possibility of attaching such employees to the Research Institutes, Mukteswar, Izatnagar and New Delhi in consultation with the Directors of those Institutes.

Item No. of the agenda.	Subject.	Brief recommendation.
4	Request from the Inter-University Board, India for supply of a list of subjects suitable for research at the Universities.	The Board recommended as follows :— The I. C. A. R. should suggest to Universities the lines along which collaboration with them in research could be effected. Views of Universities in the matter and a statement showing nature of existing facilities for research in them would be welcome. The Inter-University Board may consider whether a machinery could not be set up by which the workers at the I. A. R. I. and Research Institutes could have opportunities of being associated with the work of Universities. Similarly Universities could send some of their workers on specific problems to the Research Institutes. Provincial and Central Governments and Agricultural Institutes should encourage deputation for short periods of members of their Departments to work in Universities and *vice versa*.
5	(1) Application from the National Academy of Sciences, India, Allahabad, for a annual recurring grant of Rs. 1,000. (2) Application from the Editor-in-Chief, 'Current Science', Bangalore, for an annual grant of Rs. 500. (3) Application from the Indian Science News Association, Calcutta, for a subvention from the funds of the Imperial Council of Agricultural Research (no amount has been specified.)	The Board did not recommend the applications.
9(*a*)	Extension of Fruit Research Scheme, Bengal, beyond 1st March 1940. (Rs. 15,912 for two years).	The Committee recommended the extension of the scheme for one year only.
9(*b*)	Fruit Research—Extension Scheme Baluchistan Fruit Canning—Revised Scheme.	The Board did not recommend the extension of the scheme.
10(*a*)	Application from the Government of the United Provinces for a grant of Rs. 25,633 spread over three years for investigations on the black tip disease of mangoes by S. N. Das Gupta of the Lucknow University.	The Board recommended the application.
10(*b*)	Application from the Government of Bengal for a grant of Rs. 18,690 spread over five years for a scheme of research on the cytogenetics of (1) Mangifera Indica including the cultivated mangoes (2) Musa paradisiaca var Sapientum including cultivated bananas by Professor S. P. Agharkar.	The Advisory Board recommended the scheme with certain alteration.

Item No. of the agenda.	Subject.	Brief recommendation.
10(c)	Application from the Government of the North-West Frontier Province for a grant of Rs. 44,940 spread over five years for a scheme of research work on fruit and vegetable drying.	The Board recommended the scheme with some modifications.
14(a)	Rice Research—extension scheme Bengal beyond 1st April 1940.	The Board approved the extension of this scheme till March 31st, 1942, the situation being reviewed in 1941.
14(b)	Rice Research—Extension scheme, Bihar beyond 31st March 1940.	The Board recommended the extension of the scheme on the condition that the Provincial Government agreed to bear the cost of Assistant Botanist up to 31st March 1942.
14(c)	Rice Research Extension Scheme, Orissa, beyond 19th January 1940.	The Board decided that just as the Council was meeting at present only 50 per cent. of the expenditure of the Jeypur station, the other 50 per cent. being met by the Maharaja, the future extension of the scheme should be sanctioned on 50 : 50 basis.
14(d)	Continuance of the Research in deep water paddy in Assam beyond 1st April 1940.	The Board considered that the previous recommendation of the Board of provision of Rs. 26,200 during the three years 1940-41 to 1942-43 by the Imperial Council of Agricultural Research should be adhered to, and that Dr. Mitra and Mr. Majid should go over the programme with the Agricultural Commissioner. Mr. Ramiah who had visited the station should also give his assistance.
15(a) (i)	Application from the Government of the Punjab for a grant of Rs. 11,070 spread over five years for a scheme for investigating problems of quality in fine rices in the Punjab.	The Board recommended the scheme for sanction. It also recommended that the quality of talc as a preservative may be tested in connection with this scheme.
15(b)	Scheme from the Government of Madras for a study of the rice-growing conditions and the botanical and chemical work on rice in more advanced countries. (Rs. 3,500 for six months).	The Board recommended that the consideration of the scheme be postponed due to war conditions.
15(c)	Application from the Government of Sind for a grant of Rs. 74,410 spread over 5 years for a scheme on manurial and agronomic work and water requirements of rice in Sind.	The Board recommended that the agronomic and cultural part of the work on the scheme should be a provincial responsibility and in view of this reduction in the programme recommended provision of funds by the Council for three members of the staff, *i.e.*, one Agronomist, one Senior Assistant and one Graduate Assistant The financial liability of the Council would then amount to Rs. 29,760 for five years with suitable additional provision being made for travelling allowance and for leave salary. The question as to what amount of travelling allowance for the

Item No. of the agenda.	Subject.	Brief recommendation.
		staff if any should be provided was left to be discussed along with the general question by the Advisory Board.
16(*a*)	Further consideration of Sir John Russell's recommendation regarding diseases of rice.	The Board agreed that the consideration of this matter should be deferred and the report of the special Sub-Committee should be awaited.
16(*b*)	Use of talc for polishing and preserving purposes in the rice industry.	The Board considered it inadvisable to take up the study of talc as a polishing agent but recommended that its quality as a preservative may be tested in connection with the Punjab scheme for investigating the problems of quality in fine rices in the Punjab.
16(*c*)	Question of placing the standing Rice Committee on a permanent basis on the lines of the Indian Central Cotton Committee.	The Board recommended that the rice Committee should meet often and should devote more attention to rice development and rice marketing and if this Committee was not in a position to do so on account of technical or financial difficulties, steps should be taken to establish instead a statutory committee on the lines of the Indian Central Cotton Committee.
19(*a*)	Proposal for the extension of the Patato Breeding Scheme for Northern India at a cost of Rs. 84,000 (round) spread over five years.	The Board recommended the scheme for five years' extension.
19(*b*)	Proposal for the renewal of the scheme for research into the systematic cultivation of medicinal plants and the study of food poisons under Colonel Chopra for a further period of 3 years at an additional cost of Rs. 26,305.	An extension for a period of three years with effect from 1st April 1940 at a cost of Rs. 32,305 to the Council, was recommended by the Board.
19(*c*)	Proposal for the extension of the sunn-hemp scheme, Madras, for a period of three years at a cost of Rs. 1,500.	An extension for about 2 years at a cost to the Council of Rs. 1,000 was recommended by the Advisory Board.
19(*d*)	Scheme for the extension of the Botanical Sub-station and Pusa for a period of five years from the 1st October 1940 at a cost of Rs. 1,63,260.	The Board recommended the extension of the Sub-station on the existing basis till 31st March 1941.
19(*e*)	Application from Rai Bahadur Dr. K. C. Mehta for a grant of Rs. 58,314 spread over three years for the continuance of investigations on cereal rusts in India.	The Board recommended the extension of the scheme on the basis of Dr. Mehta's revised proposals, at a cost to the Council of Rs. 42,864 for the period of 3 years from 1st April 1940 to 31st March 1943.
20(*a*)	Application from the Government of the United Provinces for a grant of Rs. 15,300 spread over three years for research work on the changes of crops and crop rotation in relation to nutribution by Dr. Radhakamal Mukherjee.	The Board recommended that the scheme be referred back with the suggestion that it should be re-submitted with the following details :— (*a*) Details of items on which information will be collected. (*b*) Number of villages, families, individuals proposed to be surveyed in each district.

Item No. of the agenda.	Subject.	Brief recommendation.
		(c) Details of analysis in the Physiological Laboratory. (d) Scheme of statistical analysis with an explanation of how this is proposed to be done, as no staff is provided for this purpose.
20(b)	Application from the Government of the United Provinces for a grant of Rs. 82,810 spread over five years for a scheme of research on perfume yielding plants by Dr. B. N. Singh and Rai Sahib J. N. Rakshit.	After discussion, the Board recommended that the scheme be referred back to the authors for redrafting in consultation with the Harcourt Butler Technological Institute, where they had got a fully equipped laboratory and had got some definite results on the subject of perfumes and essence oils, giving more details about the plants which they actually wish to grow.
20(c)	Application from the Government of the United Provinces for a grant of Rs. 34,334 spread over five years for a scheme for the breeding of rust resistant wheats and barley for the plains.	The Board recommended that the scheme should not be sanctioned.
20(d)	Application from the Government of Sind for a grant of Rs. 75,000 spread over five years for a scheme of research on pulses.	The Board recommended the scheme subject to the following reductions being made in the budget estimates and subject to any further modification that might be considered necessary in the light of the recommendations made by the proposed Pulses Committee :— 1. The capital expenditure should be cut out completely. 2. The staff proposed should be reduced by one graduate assistant. 3. Contingencies should be reduced from Rs. 5,000 to Rs. 3,000 per annum. 4. Travelling Allowance—Only Rs. 1,000 should be provided for the first and Rs. 500 each for subsequent years. 5. The Provincial Government should contribute 50 per cent. of the total estimated cost, as revised above.
20(e)	Application from the Government of Sind for a grant of Rs. 21,700 spread over five years for a scheme of seed production of high yielding strains of berseem crop in Sind and the maintenance of nucleus of pedigree seed.	The Board recommended that the scheme should not be sanctioned.

Item No. of the agenda.	Subject.	Brief recommendation.
20(*f*)	Scheme for investigation into the prospects of increasing cinchona cultivation in India.	The Board recommended that the scheme should be sanctioned subject to the observations made by the Botany and Physiological Committee and that it should be pushed forward with the utmost expedition, but as it involved a very heavy cost beyond the resources of the Council, the Government of India should be moved to provide a special grant for financing it.
20(*g*)	Application from the United Planters' Association of Southern India for a grant of Rs. 26,380 spread over 3 years and 3 months for a scheme of research on cardamoms.	The Board came to the conclusion that suitable co-ordinated work on cardamoms in South India could not be done without the preliminary survey suggested by the United Planters Association and therefore recommend that this preliminary survey at a cost of Rs. 4,000 be undertaken as soon as possible and that the sanction of the Governing Body be obtained if necessary, by circulation and that priority may be obtained for this survey. It is anticipated that the report of the survey should be available for the consideration of the Advisory Board not later than a year hence. The officer conducting the survey should have as one of its terms of reference the outlining of a scheme for co-ordinated research which should include a central station and sub-centres in important cardamom areas.
20(*k*)	Application from the Government of Travancore for a grant of Rs. 10,572 spread over 3 years for a scheme of investigation of the two major pests of cardamoms in Travancore.	
20(*i*)	Application from the Government of Sind for a grant of Rs. 33,600 spread over five years for a scheme of research on bidi tobacco.	The Advisory Board decided to include the leave salary of the staff in the estimated cost, and with this addition, the scheme was recommended for sanction on a 50 : 50 basis.
20(*j*)	Application from the Government of Bombay for a grant of Rs. 41,360 spread over five years for a scheme of research on the improvement of the pulse crop in Bombay.	This scheme was approved in principle subject to any modifications that might be considered necessary in the light of the recommendations made by the proposed Pulses Committee.
	Schemes on mixed farming from	
21	(*i*) The United Provinces . . (*ii*) The North-West Frontier Province. (*iii*) Orissa. (*iv*) Sind.	The Board agreed that the schemes, as modified by the Sub-Committee appointed by the Fodder and Grazing Committee, may be approved subject to such alterations as may be accepted by the Chairman in accordance with notes to be sent up by the provinces concerned for the purpose. It was also agreed that the record should be simplified and the form in which it should be kept should be settled in consultation with the Statistician to the Council.

Item No. of the agenda.	Subject.	Brief recommendation.
21(e)	Question of the plantation of fodder trees.	The Board recommended the plantation of fodder trees in arid regions where there was a scarcity of grasses and suggested that in respect of other areas experiments should be carried to ascertain the yield and nutritive value of fodder trees and the number of cattle that could be maintained per acre therefrom and to determine the best lopping technique. Further recommendations could be made later after results of these investigations were known.
21(e) (ii)	Application from the Government of Sind for a grant of Rs. 86,400 spread over a period of ten years for a scheme to establish tree plantations for fodder purposes in Sind.	The Board recommended that the proposals for plantation of fodder trees should be linked up with the Dry Farming schemes and the scheme should be revised accordingly.
24(a)	Application from the Government of Madras for a grant of Rs. 54,104 spread over five years for a scheme of research on the important phytophthora diseases of the major economic crops of South India.	The Board did not recommend the scheme.
24(b)	Application from the Muslim University, Aligarh, for a grant of Rs. 5,108 spread over two years for conducting research on the fundamentals of biology of insect pests of important local crops, together with the study of their parasites and the essential features of their parasitism coupled with training of post-graduate students in agricultural entomology.	The Board did not accept the scheme on account of its comprehensiveness and vagueness and agreed that these remarks would be forwarded to the University who would be asked to send up proposals in the light of these remarks for research on specific problems.
24(c)	Scheme for the survey of sugarcane borers—proposals to test the new sampling technique in a few selected areas.	The proposals were approved and it was decided that the new programme should be started from the 1st of January 1940. It was further agreed that in future such scheme should be placed before the appropriate Entomological or other committee, irrespective of whether they had been placed before the Sugar or other commodity Committee or not. It was also held that the opinion of the Entomologists of the Imperial Agricultural Research Institute, the Punjab, the United Provinces and Madras should be obtained about the forms within one month and they should be revised if necessary.

Item No. of the agenda.	Subject.	Brief recommendation.
24(*f*)	Application from the United Provinces Government for a grant of Rs. 70,500 spread over three years for a scheme of further research on Pyrilla.	The scheme was referred back for further information as to how the problems would be actually tackled in practice. It was also essential that Dr. Ramdas of the Agricultural Meteorology Section should be consulted with regard to the technique of measurement of climate, particularly micro-climate, in the various centres of observation.
29(*a*)	Study of soil problems in Bengal—Extension beyond 1st July 1940.	The Board recommended that work on water requirement of crops, studies on the optimum moisture requirement for a particular crop and the influence of soil water ratio on the crop yield, should be dropped and that as the scheme had been in operation for nearly seven years the work should be completed within the extension period and after that the scheme should be terminated. In regard to the financial aspect of the scheme, the Board agreed to the total expenditure of Rs. 13,036 as stated in Annexure II with the proviso that the Secretariat of the Council should consider the validity of the position of the leave salary and other salaries. As a consequence of items (3), (4) and (5) having been dropped the contribution of Rs. 7,530 of the Bengal Government would not be available as stated in the scheme.
29(*b*)	Indian Institute of Science—Cheap synthetic manure scheme—beyond 1st January 1940.	The Board recommended as follows:—that work on item (3) only, namely, Night-soil wood ash peudrette, should be continued and that there was no need to go on with items (1) and (2), namely, Fertiliser value or availability of plant nutrients in compost and Composted vs. uncomposted materials and degree of necessary composting; that the scheme should be extended for two years instead of for three years with the proviso that the work should be completed within that period and the scheme terminated afterwards; that field experiments should be carried out at any agricultural station and that the investigation should not include any field experiment at the Institute of Science.
31(*a*)	Application from the Government of Bombay for a grant of Rs. 61,300 spread over five years for an All-India Crop Forecast. Improvement Scheme.	The Board did not recommend the scheme.

Item No. of the agenda.	Subject.	Brief recommendation.
31(e)	Proposal for the further retention of the Locust Research Entomologist and his compiling staff for a further period of five months from 1st January 1940 (Rs. 8,027).	The Advisory Board recommended the scheme.
33	Application from Mr. A. E. Slater, Mission Poultry Farm, Etah, for a grant of Rs. 36,675 spread over a period of 5 years, for the continuance of breeding experiments under the scheme for the improvement of goats in the United Provinces.	The Board recommended that Mr. Slater should be requested to put up a revised scheme in consultation with the Director of Veterinary Services, United Provinces, and that the Provincial Government may be asked to state what amount they were prepared to contribute towards the cost of the scheme.
34(a)	Application from the Government of Bihar for a grant of Rs. 27,130 spread over a period of five years for a scheme of sheep-breeding in the province.	The Board recommended that the work should be confined to the improvement of the indigenous sheep in Bihar starting with a flock of 200 carefully selected animals, and that the portion relating to cross-breeding with Bikaners should be omitted. This would reduce the cost of the scheme by Rs. 400, *i.e.*, to Rs. 26,730 and it was decided to recommend this modified scheme for acceptance, provided the Bihar Government agreed to bear half the total cost.
34(b)	Application from the Government of the Punjab, for a grant of Rs. 17,100 spread over a period of five years for a scheme to supplement livestock investigation work at the Government Cattle Farm, Hissar.	The Board recommended the scheme with certain modifications.
34(c)	Application from the Government of the United Provinces for a grant of Rs. 3,65,494 for a period of 5 years for a scheme for the improvement of Himalayan Cattle.	The Board recommended that the United Provinces Government may be informed that in sending up the scheme they should make it clear what the cattle population in that area approximately is and on what grounds they can justify a grant from this Council in view of the fact that hitherto we have not allotted grants for cattle-breeding in the Provinces. The question of fodder for improving the cattle should also form part of the scheme.
34(e)	Application from the Pattager of Palayakottai for a grant of Rs. 99,868 (non-recurring Rs. 1,540 and recurring Rs. 98,328) spread over a period of ten years for a scheme for the improvement of the Kangayam breed of cattle.	The Committee recommended the scheme for acceptance with the following modifications :— (a) The experimental herd should be increased from 30 to 50 heifers ; (b) Pay of the Officer-in-charge should be that of a Class II Officer in Madras, *i.e.*, Rs. 190—25/2—290—30/2—560. (c) One peon should be reduced. (d) Contingencies from second year should be reduced to Rs. 300 per year.

Item No. of the agenda.	Subject.	Brief recommendation.
34(*f*)	Application from the Government of the Punjab for a grant of Rs. 13,422 spread over 3 years for a scheme for starting a Herd Book and Pedigree Registration in respect of the Hariana Breed of cattle.	The scheme was recommended for acceptance with certain modifications.
38	Application from the Government of the Punjab for a grant of Rs. 2,825 for one year for the extension of the Parasitological Research Scheme.	The Board did not recommend the extension.
39(*a*)	Application from the Government of the Punjab for a grant of Rs. 8,850 spread over a period of 5 years for poultry disease investigation work.	It was recommended for acceptance, with the modification that the officer appointed should work in collaboration with the Pathologist at Mukteswar, until the special officer to be appointed for the investigation of poultry diseases at Izatnagar commences his duties.
39(*b*)	Application from the Director, Imperial Veterinary Research Institute, for a grant of Rs. 47,000 spread over a period of five years for a scheme of research (*i*) into the damage caused by ticks to hides and skins and (*ii*) for the extension of the warble fly scheme for a period of five years.	The scheme was recommended.
39(*c*)	Scheme for the preparation of a critical monograph on 'Rinderpest in India'.	The Board recommended that an honorarium should be sanctioned at the rate of Rs. 12 per 1,000 words with a maximum of Rs. 1,000.
40-I.	Application from the Government of Bengal for a supplementary grant of Rs. 5,840 in connection with the scheme for animal nutrition work in Bengal.	The scheme was recommended subject to certain modifications.
41(*a*)	Application from the Government of the Punjab for a grant of Rs. 5,800 for a period of three years for a scheme of study of the nutritional requirements of milch cattle.	The scheme was recommended with certain modifications.
41(*b*)	Application from the Director, Imperial Veterinary Research Institute, Mukteswar for a grant of Rs. 53,000 for a period of 5 years for the inclusion of milch cows in the molasses nutrition scheme.	The Board recommended the postponement of this scheme until such time as the results of the preliminary trials on bullocks are available. They also recommended that, in revising the scheme, the experience gained and the results obtained hitherto, particularly at the Imperial Dairy Institute, Bangalore, and the Imperial Agricultural Research Institute, New Delhi, where work is still in progress, should also be examined.
41(*c*)	Scheme for writing up a monograph on 'Animal Nutrition in India'.	The Board recommended the scheme for approval and agreed that the honorarium should be fixed at Rs. 12 per 1,000 words subject to a maximum of Rs. 1,000.

Item No. of the agenda.	Subject.	Brief recommendation.
42	Application from the Registrar, Calcutta University for a grant of Rs. 15,600 spread over a period of three years, for the extension of the scheme for investigation into the life history, bionomics and development of fresh water fishes in Bengal.	The Board recommended the extensions with some modifications.
44(c)	Consideration of allotment of funds to Provinces for marketing work from the 1st April 1940.	The allotments as proposed by the Agricultural Marketing Adviser were agreed to.
46	Application from the Government of the United Provinces for a grant of Rs. 45,000 spread over a period of five years for a scheme of research work on *ghee to* be undertaken at the Harcourt Butler Technological Institute, Cawnpore.	The Board was of the opinion that fundamental research of the kind proposed in items 1 to 4 on page 4 of the scheme would be best carried out in the Central Dairy Research Institute. In regard to item 5, however, *viz.*, 'Special investigations for the detection of adulteration of *ghee* with small quantities of foreign substances', it was recommended that a separate scheme may be submitted for the purpose of obtaining a quick test for adulterants in *ghee*.

APPENDIX IV

Personnel of Committees

Sugar Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research.
2. The Agricultural Commissioner with the Govt. of India.
3. The Director, Imperial Agricultural Research Institute, New Delhi.
4. The Director, Imperial Institute of Sugar Technology, Cawnpore.
5. The Imperial Sugarcane Expert, Coimbatore. (S. I.)
6. The Agricultural Marketing Adviser to the Government of India, Civil Lines, Delhi.
7. The Director of Agriculture, Madras.
8. Gosta Behari Pal, Esq., Agricultural Chemist, Bengal, Dacca.
9. The Economic Botanist (Sugarcane) to Government, United Provinces, Shahjahanpur.
10. The Deputy Director of Agriculture, In-Charge Cane, United Provinces, Lucknow.
11. The Director of Agriculture, Punjab, Lahore.
12. The Director of Agriculture, Bihar, Patna.
13. The Sugarcane Specialist, Sugarcane Research Scheme, Pusa. (Bihar).
14. The Director of Agriculture, Mysore, Bangalore.
15. The Cane Commissioner, United Provinces, Lucknow.
16. The Cane Commissioner, Bihar, Patna.
17. Lala Har Sahai Gupta, B.A., M.L.C., Shankar Agricultural Farm, Bilari, (Moradabad).
18. Pandit Hira Vallabh Tripathi, Honorary Secretary, Sugarcane Growers' Co-operative Society, Saharanpur. (U. P.)
19. Rajeshvar Prashad Narayan Sinha, Esq., M.L.A., Village Birsingpur, P.O. Birsingpur, Distt. Darbhanga.
20. Nawab Malik Sir Mohammad Hayat Khan Noon, M.L.A., Lahore, (Punjab).
21. Mr. Hamidul Huq Chowdhury, M.L.C., 34, Beniapukar Road, Calcutta.
22. Sri Balusu Butchi Sarvarayudu, Zamindar of Kapileswarapuram, Ramachandrapur Taluk, East Godavari Dist. (Madras).
23. Lala Shri Ram, 20-22, Curzon Road, New Delhi.
24. Mr. D. R. Narang, Basti Sugar Mills Co., Ltd., Basti, (U. P.)
25. B. L. Gray, Esq., Messrs. Begg Sutherland and Co., Ltd., "Sutherland House", Cawnpore.
26. Dr. C. H. Nielson, The Saraya Sugar Factory, Sardarnagar, Distt. Gorakhpur, (U. P.)
27. Prof. V. G. Kale, Professor of Economics, Bombay University, Bombay.
28. Raja Sri Ravu Sir Swetachalapati Ramakrishna Ranga Rao Bahadur, Raja of Bobbili, Bobbili, (Madras).
29. D. P. Khaitan, Esq., 8, Royal Exchange Place, Calcutta.
30. Mirza Abdul Latif Beg, Kiratpur, Distt. Bijnor, (U. P.)
31. Jagjiwan Ujamshi Mulji, Esq., 32, Apollo Street, Bombay.
32. Mr. S. J. Pagey, Shakkar Patti, Cawnpore.
33. Chaudhri Mukhtar Singh, Daurala Sugar Works, Daurala, (Meerut).
34. Nawab Dr. Sir Muhammad Ahmad Said Khan, K.C.S.I., K.C.I.E., M.B.E., LL.D., Nawab of Chhatari, Chhatari. Dist. Aligarh.
35. Prof. N. G. Ranga, M.L.A. (Central), 23, Stringers Street, George Town, (Madras).
36. Walchand Hirachand, Esq., Phoenix Building. Ballard Estate, Fort, Bombay.

The Secretary, Imperial Council of Agricultural Research—Secretary *ex officio*.

Wheat Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman, *ex-officio.*
2. The Agricultural Commissioner with the Government of India, Imperial Council of Agricultural Research.
3. The Agricultural Marketing Adviser to the Government of India.
4. The Economic Adviser to the Government of India.
5. The Senior Marketing Officer (Wheat).
6. The Statistician, Imperial Council of Agricultural Research.
7. The Director, Imperial Agricultural Research Institute.
8. The Imperial Economic Botanist, New Delhi.

9-17. The Directors of Agriculture, United Provinces, Punjab, Bihar, Central Provinces and Berar, Sind, Hyderabad, the Commissioner of Agriculture, Baroda, and the Director of Agriculture, Bhopal, and the Agricultural Officer, North-West Frontier Province.

18—22. Five representatives of wheat growers, one each from United Provinces, Punjab, Bihar, Central Provinces and Berar and Sind.

United Provinces.—Nawab Jamshed Ali Khan, Bhagpat, Meerut (U. P.)

Punjab.—Sir W. Roberts, C.I.E., Managing Director, British Cotton Growers' Association, Khanewal.

Bihar.—Pandit Gobind Pati Tiwari, M.L.A., Village Daulapur, P. C. Bethua Bazar, Dist. Saran.

Central Provinces and Berar.—Sjt. Beohar Rajendra Sinha, M.L.S., Jubbulpore.

Sind.—Mr. P. S. Tolani.

23. The Crop Botanist, Bombay.
24. The Cerealist, Lyallpur.
25. The Economic Botanist, (Rabi Cereals) U. P.
26. The Economic Botanist, Central Provinces and Berar.
27. The Economic Botanist, Sind.
28. The Rust Research Officer—Dr. K. C. Mehta, Agra College, Agra.

29-30. Two Professors of Economics—

1. Dr. Radhakamal Mukerjee, M.A., Ph.D., Professor of Economics, Lucknow University, Lucknow.
2. Professor A. C. Sen-Gupta, M.A. (Edin), I.E.S., Head of Department of Economics, Nagpur University, Nagpur.

31. A representative of the Associated Chamber of Commerce—Mr. C. T. Mason, c/o Messrs. Owen Roberts & Co. Ltd., Lahore.

32. A representative of the Federation of the Indian Chambers of Commerce and Industry—Mr. Rati Lal Mulji Gandhi, C/o Messrs. R. Rati Lal & Co., 4, Chinch Bunder Road, Bombay 9.

33—36. Four representatives of wheat trade, one each from Karachi, United Provinces, Punjab and Central Provinces and Berar.

Karachi.—Mr. Ruplal Shankardas C/o Messrs. Shankardas Ruplal, Ballasis Street, P.O. Box No. 196, Karachi.

Punjab.—Lala Mahanarain, Managing Director, Ganesh Flour Mills, Lyallpur.

United Provinces.—Mr. Ripusudan Singh, Hapur, Secretary, Chamber of Commerce, Dist. Meerut.

Central Provinces and Berar.—Seth Deepchand Gothi, Proprietor of the firm of Pratapmal Laxmichand of Batulganj and Itarsi, Betul.

37. One representative of the flour Milling Industry—Mr. K. L. Jathia, Chairman, Calcutta Flour Mills Association, Royal Exchange, Post Box No. 280—Calcutta.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio.*

Animal Nutrition Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman, *ex officio.*
2. The Animal Husbandry Commissioner with the Government of India.
3. Dr. P. E. Lander, Agricultural Chemist, Punjab, Lyallpur.
4. Dr. K. C. Sen, Officer-in-Charge, Animal Nutrition Section, Izatnagar.
5. Rao Bahadur B. Viswanath, Director, Imperial Agricultural Research Institute, New Delhi.
6. Mr. J. R. Haddow, Imperial Veterinary Research Institute, Mukteswar.
7. Mr. Zal R. Kothavalla, Imperial Dairy Expert, Bangalore.
8. The Director, Imperial Veterinary Research Institute, Mukteswar.
9. The Director of Veterinary Services, Army Headquarters, Simla.
10. The Director, Nutrition Research, Indian Research Fund Association, Coonoor.
11. The Director of Veterinary Services, Punjab, Lahore.
12. Babu Gostha Bihari Pal, Agricultural Chemist, Bengal.
13. Khan Sahib Syed Ghulam Husain. Animal Husbandry Officer, Bhopal.
14. The Director, Civil Veterinary Department and Veterinary Adviser to the Government of Bengal, Calcutta.
15. The Director of Veterinary Services, Bombay.
16. Dr. Burch H. Schneider, Allahabad Agricultural Institute, Allahabad.
17. The Director of Veterinary Services, United Provinces, Lucknow.
18. The Deputy Director of Agriculture, Bundelkhand Circle, Jhansi, United Provinces.
19. Mr. P. V. Ramiah, Agricultural Chemist, Coimbatore.
20. Rao Sahib D. V. Bal, Agricultural Chemist, Central Provinces and Berar.
21. Major C. E. McGuickin, Assistant Director of Military Dairy Farms, Northern Circle, Lahore Cantonment.
22. Dr. W. L. Davies, Director of Dairy Research.
    Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio.*

Fodder and Grazing Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman, *ex-officio.*
2. The Agricultural Commissioner with the Government of India.
3. The Animal Husbandry Commissioner with the Government of India.
4. The Parliamentary Secretary to the Hon'ble the Minister for Agriculture and Rural Development, Madras.
5. The Director of Remounts, Army Headquarters (or a representative).
6. The Director of Farms, Army Headquarters (or a representative).
7. Inspector General of Forests, Forest Research Institute, Dehra Dun.
8. The Director of Dairy Research, India.
9. Dr. K. C. Sen, Officer-in-Charge, Animal Nutrition Section, Izatnagar.
10. Mr. C. C. Wilson, Chief Conservator of Forests, Madras.
11. Mr. E. J. Bruen, Livestock Expert to the Government of Bombay.
12. Professor L. S. S. Kumar, College of Agriculture, Poona.
13. Mr. W. Meiklejohn, Senior Conservator of Forests, Bengal, Darjeeling.
14. Mr. L. A. Smythies, Chief Conservator of Forests, United Provinces.
15. The Director of Agriculture, U. P., Lucknow.
16. Dr. R. Maclagen Gorrie, District Forest Officer, Siwaliks Division, Punjab.
17. Capt. W. S. Read, Superintendent, Government Cattle Farm, Hissar.
18. The Director of Agriculture, Bihar.

19. The Conservator of Forest, Bihar.
20. Lt.-Col. C. A. Maclean, Deputy Director of Agriculture, Bihar.
21. Mr. E. A. H. Churchill, Deputy Director of Agriculture, Central Provinces and Berar.
22. The Agricultural Officer, North-West Frontier Province.
23. The Director of Agriculture, Sind, Karachi.
24. The Deputy Director of Agriculture, Orissa.
25. Mr. Fuzlul Haq, Deputy Director of Agriculture, Assam.
26. The Commissioner of Agriculture, Baroda.
27. The Director of Agriculture, Bhopal.
28. Sardar Bahadur Sir Datar Singh.

The Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio*.

Soil Science Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman, *ex-officio*.
2. The Agricultural Commissioner with the Government of India.
3. The Agricultural Chemist, United Provinces.
4. The Agricultural Chemist, Punjab.
5. The Agricultural Chemist, Bihar.
6. The Agricultural Chemist, Central Provinces.
7. The Agricultural Chemist, Sind.
8. The Deputy Director of Agriculture, Orissa.
9. Lieutenant-Colonel C. A. MacLean, I. A. S., Deputy Director of Agriculture, Bihar.
10. Rao Bahadur B. Viswanath, F.I.C., Officiating Director, Imperial Agricultural Research Institute, New Delhi (Soil Chemist).
11. Dr. J. K. Basu, Soil Physicist, Sugarcane Research Scheme, Bombay-Deccan (Soil Physicist).
12. Dr. P. G. Krishna, Agricultural Chemist to the Government of Hyderabad (Soil Physicist).
13. Dr. E. MacKenzie Taylor, M.B.E., Director, Irrigation Research, Punjab (Soil Physicist).
14. Dr. J. C. Ghosh, D.Sc., Director, Indian Institute of Science, Bangalore (Physical Chemist).
15. Dr. J. N. Mukherjee, D.Sc., Kaira Professor of Chemistry, Calcutta University.
16. Mr. P. H. Carpenter, Chief Scientific Officer, Indian Tea Association, Assam.
17. Dr. Nazir Ahmad, Direcor, Technological Laboratory, Indian Central Cotton Committee, Bombay.
18. Dr. J. K. Dubey, Director of Agriculture and State Chemist, Government of Bhopal.
19. Mr. R. G. Allan, Commissioner of Agriculture, Baroda.
20. Dr. Sri Krishna, Bio-Chemist, Forest Research Institute and College, Dehra Dun.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio*.

Rice Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman *ex officio*.
2. The Agricultural Commissioner with the Government of India.
3. The Agricultural Marketing Adviser to the Government of India.
4. The Economic Adviser to the Government of India.

5. The Senior Marketing Officer (Rice).

6. The Statistician, Imperial Council of Agricultural Research.

7—20. The Directors of Agriculture, Madras, Bombay, Bengal, United Provinces, Bihar, Central Provinces, Assam, Sind, Hyderabad, Mysore, Travancore, Cochin and Kashmir and the Commissioner of Agriculture, Baroda.

21. The Deputy Director of Agriculture, Orissa.

22. The Hon'ble Mr. Hossain Imam.

23—30. *Eight representatives of rice growers*, one each from Madras, Bombay, Bengal, United Provinces, Bihar, Central Provinces, Assam and Orissa.

23. *Madras.*—Sri T. S. Kuttalalingam Pillai, Landlord, Ilangi P. O. Tenkasi (S. I.), Tinnevelly District.

24. *Bombay.*—Mr. Govind Dharmaji Vartak, Virar, District Thana.

25. *Bengal.*—Khan Sahib Maulvi Syed Muhammad Afzal, M.L.A., P.O. Pirojpur, District Bakargauj.

26. *United Provinces.*—Mr. Prayag Dhwaj Singh, B.A., LL.B., M.L.A., Deoria, Gorakhpur.

27. *Bihar.*—Babu Jamuna Prasad Singh, M.L.A., Gaya.

28. *Central Provinces and Berar.*—Pandit W. B. Lakhe, B.A., Malguzar of Kisla and Kusmi, Raipur.

29. *Assam.*—Mr. A. K. Chanda, Bar-at-Law, M.L.A., Silchar, Cachar District.

30. *Orissa.*—Sri Sarangdhar Das, B.A. (Calif. U. S. A.), Chandni Chowk P. O. Cuttack.

31. The Paddy Specialist, Madras, P. O. Lawley Road, Coimbatore.

32. The Crop Botanist, Bombay, Karjat, District Kolaba.

33. The Economic Botanist, Bengal, Dacca.

34. The Economic Botanist (Sugarcane and Paddy), United Provinces, Shahjahanpur.

35. The Rice Specialist, Bihar, Sabour.

36. The Rice Botanist, Rice Research Station, Raipur (C. P.)

37. The Economic Botanist (Rice) Habiganj Paddy Farm Assam.

38. The Paddy Specialist, Orissa, Cuttack.

39-40. Two Professors of Economics (selection)—

39. Professor P. J. Thomas, D. Phil., M.L.C., Professor of Economics, University of Madras.

40. Dr. H L. Dey, Professor in the Department of Economics, and Politics, Dacca University.

41. A representative of the Associated Chamber of Commerce—Rai Upendra Lal Raj Bahadur, Prade Square, Chittagong.

42. A representative of the Federation of the Indian Chamber of Commerce and Industry—Mr. Ashutosh Bhattacharyya, 69-2, Chetla Road, P. O. Alipore, Calcutta.

43. One Wholesale Rice Merchant (selection)—K. P. V. S. Mohamad Meera Rowther Sahib Bahadur, Merchant and Agent, Negapatam, (S. I.)

44. One Rice Miller—Mr. B. K. Roy, 11C, Chetla Central Road, Alipur, Calcutta.

45. Additional Rice Miller—Sri Rao Sahib C. Subbiah Chetty, Rice Miller, Nellore, Madras.

46-47. Two Trade representatives, one each from Madras and Bengal.

46. *Madras.*—Sri N. Rangaswami Reddiar, Merchant, Kuttalam, Tanjore District.

47. *Bengal.*—Mr. M. A. Ispahani, M.L.A., Muslim Chamber of Commerce, Calcutta.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio.*

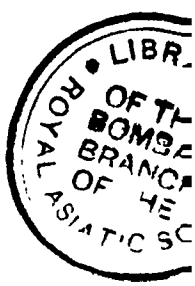
Locust Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman *ex-officio.*
2. The Agricultural Commissioner with the Govt. of India.
3. The Director of Agriculture, Punjab.
4. The Director of Agriculture, Sind.
5. The Imperial Entomologist, Imperial Agricultural Research Institute, New Delhi.
6. The Entomologist to Government, Punjab.
7. The Agricultural Officer, North West Frontier Province.
8. The Agricultural officer, Baluchistan.
9. Khan Bahadur Mian Afzal Hussain, Vice-Chancellor, Punjab University.
10. Rao Bahadur Y. Ramachandra Rao, Locust Research Entomologist to the Imperial Council of Agricultural Research.

The Secretary, Imperial Council of Agricultural Research—Secretary *ex officio.*

Cattle Breeding Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research.
2. The Animal Husbandry Commissioner with the Government of India.
3. The Director of Veterinary Services, Punjab, Lahore.
4. Major McGuickin, Assistant Director of Military Dairy Farms, Northern Circle, Lahore Cantonment.
5. Mr. E. J. Bruen, Livestock Expert, Bombay.
6. Khan Sahib Chowdhury Dost Mohammad Khan, Proprietor, Jahangirabad Cattle Farm, Jahangirabad.
7. The Deputy Director of Agriculture, Bundelkhand Circle, Jhansi, U. P.
8. Mr. Zal R. Kothavala, Imperial Dairy Expert, Bangalore.
9. The Director of Veterinary Services, Bihar, Patna.
10. Mr. Wynne Sayer, Imperial Agricultural Research Institute, New Delhi.
11. The Director of Veterinary Services, United Provinces, Lucknow.
12. The Senior Marketing Officer in Charge of Livestock.
13. Sardar Bahadur Sir Datar Singh, Montgomery Dairy Farm, Montgomery.
14. Mr. K. P. R. Kartha, Animal Husbandry Bureau, Imperial Council of Agricultural Research.
15. Mr. F. J. Gossip, Livestock Expert, Bengal, Dacca.
16. The Superintendent, Civil Veterinary Department, North West Frontier Province, Peshawar.
17. The Livestock Development Officer, Madras, Hosur.
18. Mr. J. V. Takle, Extra Assistant Director, Animal Husbandry, Central Provinces and Berar, Nagpur.
19. Mr. R. C. Woodford, Deputy Director of Agriculture (Livestock), Assam, Shillong.
20. Sardar Santokh Singh, Civil Lines, Jullundur City.
21. The Director, Imperial Veterinary Research Institute, Mukteswar.
22. Mr. N. R. Kothawala, Ellis Bridge, Ahmedabad.
23. Sir Chunilal V. Mehta, Queens Mansions, Prescott Road, Bombay.
24. The Director of Agriculture, Mysore.
25. Pattagar of Palayakotai, Palayakotai, *via* Erode.
26. The Director, Civil Veterinary Department, Hyderabad (Deccan).
27. The Assistant Director of Veterinary Services, Orissa.
28. The Director, Civil Veterinary Department, Assam.
29. The Livestock Officer, Sind, Karachi.



30. Lt.-Col. MacLean, Deputy Director of Agriculture, Bihar, Patna.
31. The Deputy Director of Animal Husbandry, Baroda.
32. The Director of Agriculture, Travancore.
33. The Superintendent, Civil Veterinary Department. Kashmir.
34. The Director of Veterinary Services, Bombay.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio.*

Dairying Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research, Chairman *ex-officio.*
2. The Animal Husbandry Commissioner with the Government of India.
3. The Imperial Dairy Expert, Bangalore.
4. The Director of Military Farms (or Representative), Army Headquarters, Simla.
5. Mr. W. Keventer, Messrs. Keventer and Co., Aligarh.
6. Mr. R. C. Woodford, Deputy Director of Agriculture (Livestock), Assam, Shillong.
7. Mr. E. J. Bruen, Livestock Expert, Bombay.
8. The Livestock Development Officer, Madras, Hosur.
9. The Director, Imperial Veterinary Research Institute, Mukteswar.
10. Mr. A. C. Aggarwala, Professor of Animal Husbandry, Veterinary College, Lahore.
11. Mr. J. V. Takle, Extra Assistant Director, Animal Husbandry, Central Provinces and Berar, Nagpur.
12. Mr. W. Sayer, Imperial Agricultural Research Institute, New Delhi.
13. Sardar Bahadur Sir Datar Singh, Montgomery Dairy Farm, Montgomery.
14. Mr. F. J. Gossip, Livestock Expert, Bengal, Dacca.
15. Dr. Burch H. Schneider, Allahabad, Agricultural Institute, Allahabad.
16. Mr. D. N. Khurody, Senior Marketing Officer.
17. The Deputy Director of Agriculture, Bundelkhand Circle, Jhansi, United Provinces.
18. The Director of Veterinary Services, Bihar, Patna.
19. The Director of Veterinary Services, Bombay.
20. Dr. W. L. Davies, Director of Dairy Research.
21. Mr. Mohd Azhar Ali, 131, Khialigunj, Lucknow.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio.*

Ad hoc COMMITTEES

A—MAY 1939.

Tobacco Sub-Committee.

1. Vice-Chairman, Imperial Council of Agricultural Research.
2. Agricultural Commissioner with the Government of India.
3. The Agricultural Marketing Adviser to the Government of India.
4. The Marketing Officer (Tobacco).
5. The Imperial Economic Botanist, Imperial Agricultural Research Institute.

6-12. A representative each of the Governments of Madras, Bombay, Bengal, United Provinces, Bihar, Hyderabad (preferably Deputy Director of Agriculture, Warangal), and Baroda.

13. A representative of the Government of Burma (as visitor).
14. Mr. T. G. Rama Iyer, Director of Agriculture, Mysore and *ex-officio* Chairman of the Mysore Tobacco Company, Limited.

Non-Official.

15. Mr. Chaturbhai Bhailalbhai, Tobacco Merchant, Mogri, *via* Anand, (Bombay).
16. A representative of the Indian Tobacco Association, Guntur.
17. One representative of the Indian Leaf Tobacco Development Company, Limited, Calcutta.
18. Mr. R. A. M. Major, Formana Tobacco Estates and Virginia Tobacco Planters, Saharanpur.
19. A representative of the South Indian Tobacco Industry (Nominated by Messrs. Spencer and Co., Limited, Madras.
20. Mr. N. E. Ezra of the National Tobacco Company, Limited, Calcutta.
21. Mr. Mirza Zeauddin Akamal, General Manager of the Hyderabad (Deccan) Cigarette Factory, Mushirabad (Hyderabad-Deccan).
22. Khan Saheb Mohammad Assimuddin, Haraghacha, P. O. Kalidohar Ghat, District Rangpur.
23. Mr. Abdul Ghafoor, M.L.A., Khanjauli, District Darbhanga, President of the Bihar Tobacco Association.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio*.

Fruit Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research, Chairman
2. The Agricultural Commissioner with the Government of India.
3. Rao Bahadur B. Viswanath.
4. to 11. The Directors of Agriculture :—

Madras, Bombay, Bengal, United Provinces, Punjab, Bihar, Central Provinces and Kashmir.

12. The Commissioner of Agriculture, Baroda.
13. Mr. H. C. Javaraya, Senior Marketing Officer (Fruit).
14 and 15. The Agricultural Officers, North-West Frontier Province and Baluchistan.
16. Mr. G. T. Tait.
17. The Imperial Entomologist.
18. The Imperial Mycologist.
19. Sardar Sahib Lal Singh, Fruit Specialist, Punjab.
20 Mr. K. C. Naik, Fruit Research Station, Madras.
21. Dr. G. S. Cheema, Horticulturist to Government, Bombay.
22. Dr. P. K. Sen.
23. The Horticulturist, Sind.
24. Dr. Hedayatullah, Economic Botanist, Bengal.
25. Dewan Bahadur T. Raghaviah.
26. Mr. P. H. Carpenter.
27. Mr. J. H. Sprott (Coorg).

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio*.

Fish Committee.

1. The Animal Husbandry Commissioner with the Government of India, Chairman.
2. Mr. M. S. Rao, Director of Development, Orissa.
3. Dr. S. B. Setna, Fisheries Officer to the Government of Bombay.
4. Dr. G. D. Bhalerao.
5. Khan Bahadur Mian Afzal Husain.
6. Dr. H. R. Mehta, Reader, Department of Zoology, Allahabad University.
7. Dr. H. C. Mookerjee, Head of the Department of Zoology, Calcutta University.

Secretary, Imperial Council of Agricultural Research, Secretary, *ex-officia*

Rice Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research, Chairman.
2. The Agricultural Commissioner with the Government of India.
3. The Agricultural Marketing Adviser to the Government of India.
4. The Director of Agriculture, Hyderabad.
5. The Director of Agriculture, Mysore.
6. The Commissioner of Agriculture, Baroda.
7. The Director of Agriculture, Cochin.
8. The Director of Agriculture, Travancore.
9. The Director of Agriculture, Sind.
10. The Paddy Specialist, Madras.
11. The Crop Botanist, Bombay.
12. The Economic Botanist, Bengal.
13. The Economic Botanist (Rice), United Provinces
14. The Paddy Specialist, Bihar.
15. The Officer-in-Charge, Central Provinces Rice Research Scheme.
16. The Director of Agriculture, Assam.
17. The Paddy Specialist, Orissa.
18. The Economic Botanist, Assam.
19. The Senior Marketing Officer (Rice).
20. The Statistician, Imperial Council of Agricultural Research.
21. Dewan Bahadur T. Raghaviah.
22. Sardar Bahadur Datar Singh.
23. Dr. P. K. De.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio*.

Animal Diseases Committee.

1. The Animal Husbandry Commissioner with the Government of India, Chairman.
2. The Director, Imperial Veterinary Research Institute, Muktesar.
3. The Director of Veterinary Services, Madras.
4. The Director of Veterinary Services, Bombay, Poona.
5. The Director of Veterinary Services and Veterinary Adviser to the Government of Bengal, Calcutta.
6. The Director of Veterinary Services, United Provinces.
7. The Director of Veterinary Services, Punjab, Lahore.
8. The Director of Veterinary Services, Bihar, Patna.
9. The Director of Veterinary Services, Central Provinces and Berar, Nagpur.
10. The Superintendent, Civil Veterinary Department, North-West Frontier Province, Peshawar.
11. The Superintendent, Civil Veterinary Department, Assam, Gauhati.
12. The Director of Veterinary Services, Sind, Karachi.
13. The Director of Development, Orissa, Cuttack.
14. The Director of Agriculture, H. E. H. the Nizam's Government, Hyderabad (Deccan).
15. Mr. T. G. Rama Iyer, Director of Agriculture, Mysore.
16. The Superintendent, Civil Veterinary Department, Mysore, Bangalore.
17. The Deputy Director of Veterinary and Animal Husbandry Science, Baroda.
18. The Senior Veterinary Inspector, Cochin State, Tattamangalam.

Animal Diseases Committee—*contd.*

19. The Director of Agriculture and Fisheries, Travancore, Trivandrum.
20. The Revenue Secretary, Bhopal.
21. The Director of Veterinary Services in India, Quarter Master General's Branch, Army Headquarters, Simla.
22. The Superintendent, Civil Veterinary Department, Government of Jammu and Kashmir, Srinagar.
23. Mr. G. D. Bhalerao, Helminthologist, Imperal Veterinary Research Institute, Muktèswar.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio.*

Dry Farming Committee.

1. Vice-Chairman, Imperial Council of Agricultural Research, Chairman.
2. Agricultural Commissioner with the Government of India.
3. The Director of Agriculture, Bombay.
4. Mr. Aslam Khan, Agricultural Officer, North-West Frontier Province.
5. The Deputy Director of Agriculture, III Circle, Bellary.
6. The Soil Physicist, Coimbatore.
7. The Superintendent, Hagari Farm.
8. The Chief Investigator, Dry Farming Research Scheme, Bombay.
9. The Deputy Director of Agriculture, Karnatik Division.
10. The Agricultural Chemist. Hyderabad.
11. The Imperial Agricultural Chemist, Imperial Agricultural Research Institute.
12. The Agricultural Chemist, Punjab.
13. Mr. W. M. Clark, Deputy Director of Agriculture, Bengal.
14. Dr Mukherjee, Agricultural Chemist, United Provinces.
15. Dr. S. Anwarullah, Agricultural Chemist, Bihar.
16. Sir Chunilal V. Mehta.
17. Sardar Bahadur Datar Singh.
18. Dr. J. N. Mukherjee, Calcutta University.
19. Professor P. C. Mahalanobis.
20. Rai Sahib J. C. Luthra.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio.*

Botanical and Physiological Committee.

1. Vice-Chairman, Imperial Council of Agricultural Research, Chairman.
2. The Agricultural Commissioner with the Government of India.
3. Dr. B. P. Pal, Imperial Economic Botanist, Imperial Agricultural Research Institute.
4. Dr. G. W. Padwick, Imperial Mycologist, Imperial Agricultural Research Institute.
5. Mr. P. B. Richards, Director of Agriculture, United Provinces.
6. Mr. H. R. Stewart, Director of Agriculture, Punjab.
7. Mr. P. H. Rama Reddi, Director of Agriculture, Madras.
8. Mr. J. C. MacDougall, Director of Agriculture, C. P.
9. Rao Sahib K. I. Thadani, Director of Agriculture, Sind.
10. Dr. B. L. Sethi, Economic Botanist to the Government of the United Provinces
11. Mr. T. S. Sabnis, Economic Botanist to the Government of the United Provinces.
12. Khan Sahib Chaudhri Ali Mohammed Khan, Oilseeds Botanist, Punjab.
13. Mr. A. B. H. Khoorsheed, Economic Botanist to H. E. H. the Nizam's Government.
14. Professor B. Sahni, Lucknow University.
15. Dr. V. K. Badami, Deputy Director of Agriculture, Orissa.
16. Mr. K. Ramiah, Geneticist, Institute of Plant Industry, Indore.

Botanical and Physiological Committee—*contd.*

17. Mr. A. M. Thomson, Senior Marketing Officer.
18. Mr. H. C. Javaraya, Senior Marketing Officer.
19. Dr. Hedayatullah, Economic Botanist, Bengal.
20. Mr. J. C. Ramchandani, Botanist. Sind.
21. Professor P. C. Mahalanobis.
22. Mr. J. H. Sprott.
23. Dr. P. K. Sen.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio.*

Animal Husbandry Committee.

1. The Animal Husbandry Commissioner with the Government of India, Chairman.
2. The Director, Imperial Veterinary Research Institute, Muktesar.
3. The Director of Veterinary Services, Madras.
4. The Director of Veterinary Services, Bombay, Poona.
5. The Director of Veterinary Services and Veterinary Adviser to the Government of Bengal.
6. The Director of Veterinary Services, United Provinces, Lucknow.
7. The Director of Veterinary Services, Punjab, Lahore.
8. The Director of Veterinary Services, Bihar, Patna.
9. The Director of Veterinary Services, Central Provinces and Berar, Nagpur.
10. The Superintendent, Civil Veterinary Department, Assam, Gauhati
11. The Superintendent, Civil Veterinary Department, North-West Frontier Province, Peshawar.
12. The Director of Veterinary Department, H. E. H. the Nizam's Government, Hyderabad (Deccan).
13. Mr. T. G. Rama Iyer, Director of Agriculture, Mysore.
14. The Deputy Director of Veterinary and Animal Husbandry Science, Baroda State, Baroda.
15. The Senior Veterinary Inspector, Cochin State, Tattamangalam
16. The Director of Agriculture and Fisheries, Travancore, Trivandrum
17. The Revenue Secretary, Bhopal State, Bhopal.
18. The Director of Veterinary Services in India, Quarter Master General's Branch. Army Headquarters, Simla.
19. The Director of Development, Orissa.
20. The Director of Veterinary Services, Sind, Karachi
21. The Superintendent, Civil Veterinary Department, Government of Jammu and Kashmir, Srinagar.
22. Mr. E. J. Bruen, Livestock Expert to the Government of Bombay, Poona.
23. Mr. G. S. Henderson, Sind Reclamation Company, Limited, Nazikabad.
24. Mr. W. M. Clark, Deputy Director of Agriculture, Bengal.
25. Dr. P. E. Lander, Agricultural Chemist to the Government of the Punjab, Lyallpur.
26. The Director, Imperial Agricultural Research Institute, New Delhi
27. The Director of Agriculture, Bengal.
28. Mr. N. C. Das Gupta, Research Officer, United Provinces Animal Nutrition Scheme.
29. Sardar Bahadur Datar Singh, Montgomery Dairy Farm, Montgomery.
30. Mr. Z. R. Kothavalla, Imperial Dairy Expert, Bangalore.
31. Mr. D. N. Khurody, Senior Marketing Officer.
32. Mr. J. H. Sprott (Coorg).

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio.*

Entomological and Pathological Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research, Chairman.
2. The Agricultural Commissioner with the Government of India.
3. The Director, Imperial Agricultural Research Institute.
4. Lt.-Col. E. Cotter, I.M.S., Pubilc Health Commissioner with the Government of India.
5. Mr. P. B. Richards, Director of Agriculture, United Provinces.
6. The Entomologist to Government, Punjab.
7. Mr. A. M. Mustafa, Agricultural Officer, Baluchistan.
8. The Imperial Entomologist, Imperial Agricultural Research Institute.
9. The Imperial Mycologist, Imperial Agricultural Research Institute.
10. The Director of Agriculture, Kashmir.
11. Sardar Sahib Lal Singh, Fruit Specialist, Lyallpur.
12. Mr. K. R. Narayana Iyer, Director of Agriculture, Travancore.
13. Dr. Hedayatullah, Economic Botanist, Bengal.
14. Dr. A. K. Mitra, Economic Botanist, United Provinces.
15. Khan Bahadur M. Afzal Husain.
16. Professor P. C. Mahalanobis.
17. Dr. J. C. H. Templer, Entomologist.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio*.

Statistical Committee.

1. Dr. Gregory (Chairman).
2. Professor P. C. Mahalanobis.
3. Rao Bahadur P. Viswanath
4. Professor Vakil.
5. Mr. H. R. Stewart.
6. Dr. Shirname.
7. Rai Bahadur R. L. Sethi.
8. Dr. Nazir Ahmed.
9. Mr. Carpenter.
10. Dr. B. L. Sethi.
11. Mr. W. J. Jenkins.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio*.

B.—November-December 1939.

Benares Hindu University Scheme Committee (Plant Physiology).

1. The Agricultural Commissioner with the Government of India—Chairman.
2. Mr. H. R. Stewart, I.A.S., Director of Agriculture, Punjab.
3. Dr. R. D. Rege, Sugarcane Research Station, Padegaon.
4. Dr. A. K. Mitra, Economic Botanist (sugarcane and paddy), United Provinces.
5. Dr. B. N. Singh, Head of the Institute of Agricultural Research, Hindu University, Benares.
6. Mr. Boshi Sen, Vivekananda Laboratory, Almora.
7. Mr. P. H. Carpenter.

Dry Farming Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research, Chairman.
2. The Agricultural Commissioner with the Government of India.

Dry Farming Committee—*contd.*

3—7. The Directors of Agriculture :—
Madras, Bombay, Punjab, Sind and Hyderabad.

8. The Chief Investigator, Dry Farming Scheme, Bombay.
9. Dr. P. E. Lander, Agricultural Chemist to Government, Punjab.
10. Dr. J. N. Mukerjee, Chemistry Department, Calcutta University.
11. The Agricultural Chemist, Agricultural Research Station, Sakrand (Sind).
12. Mr. Rajdeo (Hyderabad).
13. Dr. Krishna (Hyderabad).

Jowar Committee

1. The Agricultural Commissioner with the Government of India, Chairman.
2. The Director of Agriculture or the Deputy Director of Agriculture, Madras.
3. The Director of Agriculture, Bombay.
4. The Director of Agriculture or the Deputy Director of Agriculture, Hyderabad.
5. The Millet Specialist, Madras.
6. The Cerealist, Punjab.
7. The Economic Botanist, Bombay.
8. The Economic Botanist, Hyderabad.
9. The Economic Botanist, Central Provinces and Berar.
10. A Deputy Director of Agriculture from the United Provinces.
11. The Millets and Oilseeds Botanist, United Provinces.
12. The Director of Agriculture, Sind.
13. The Director of Agriculture, Mysore.
14. The Commissioner of Agriculture, Baroda.
15. The Fodder Specialist to the Government of the Punjab, (Visitor.)

Animal Breeding Committee

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman, *ex-officio.*
2. The Animal Husbandry Commissioner with the Government of India.
3. The Joint Director, Imperial Agricultural Research Institute.
4. The Director, Imperial Veterinary Research Institute.
5. The Livestock Expert, Bombay.
6. The Director of Veterinary Services, Punjab.
7. The Superintendent, Government Cattle Farm, Hissar.
8. The Director of Veterinary Services, United Provinces.
9. The Director of Agriculture, Bihar.
10. The Superintendent, Civil Veterinary Department, Kashmir.
11. The Poultry Research Officer, Imperial Veterinary Research Institute, Izatnagar.
12. Sardar Bahadur Sir Datar Singh.
13. Imperial Dairy Expert, Bangalore.
14. The Director of Dairy Research.
15. Professor James N. Warner, Allahabad Agricultural Institute.
16. The Deputy Director of Agriculture, Cattle Breeding, Bundelkhand Circle, Jhansi.
17. Professor H. K. Mookerjee, Head of the Department of Zoology, Calcutta University.
18. The Agricultural Marketing Adviser to the Government of India.
19. The Superintendent, Civil Veterinary Department, Mysore.

Animal Breeding Committee—*contd.*

20. Mr. S. M. Sarwar.
21. The Director of Veterinary Services, Bihar.
22. The Assistant Director of Veterinary Services, Orissa.
23. Mr. B. K. Dadami, Director of Veterinary Services, Hyderabad.

The Secretary, Imperial Council of Agricultural Research—Secretary *ex-officio.*

Botanical and Physiological Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman.
2. The Agricultural Commissioner with the Government of India.
3. Dr. B. P. Pal, Imperial Economic Botanist, Imperial Agricultural Research Institute.
4. Dr. G. W. Padwick, Imperial Mycologist, Imperial Agricultural Research Institute.
5—8. The Directors of Agriculture :—

Punjab, Madras, Sind and United Provinces.

9. Mr. T. S. Sabnis, Economic Botanist (Oilseeds), United Provinces.
10. Khan Sahib Chaudhri Ali Mohammad, Oilseeds Specialist, Lyallpur.
11. Mr. A. B. H. Khoorshid, Economic Botanist, Hyderabad.
12. Professor B. Sahni, The University, Lucknow.
13. Dr. V. K. Badami, Deputy Director of Agriculture, Orissa.
14. Mr. K. Ramiah, Geneticist, Institute of Plant Industry, Indore.
15. Mr. A. M. Thompson, Senior Marketing Officer.
16. Mr. H. C. Javaraya, Senior Marketing Officer.
17. Dr. Hidayetullah, Economic Botanist, Bengal.
18. Mr. J. C. Ramchandani, Botanist, Sind.
19. Professor P. C. Mahalanobis, Statistical Laboratory, Presidency College, Calcutta.
20. Mr. J. H. Sprott, Cooverelly Estate, Mangles Brothers, Coorg.
21. Dr. P. K. Sen, Fruit Physiologist to the Government of Bombay.
22. Dr. B. N. Uppal, Plant Pathologist to the Government of Bombay.
23. Dr. J. F. Dastur, Mycologist, Nagpur.
24. Ch. Ram Dhan Singh, Cerealist, Lyallpur.
25. Rai Bahadur Dr. K. C. Mehta, Agra College, Agra.
26. Dr. H. K. Nandi, Economic Botanist, Jorhat, Assam.
27. Dr. B. N. Singh.
28. Mr. Bosi Sen.
29. Mr. S. C. Sen, Superintendent, Cinchona Cultivation in Bengal, Mungpoo.
30. Dr. B. L. Sethi.
31. Mr. M. Alam.
32. Dr. Krishna (Forest Research Institute).
33. Professor L. S. S. Kumar.

Secretary, Imperial Council of Agricultural Research, Secretary, *ex-officio.*

Fruit Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman.
2. The Agricultural Commissioner with the Government of India.
3. Rao Bahadur B. Viswanath.
4—11. The Directors of Agriculture :—

Madras, Bombay, Bengal, United Provinces, Punjab, Bihar, Central Provinces and Kashmir.

12. The Commissioner of Agriculture, Baroda.
13. Mr. H. C. Javaraya, Senior Marketing Officer (Fruit).

Fruit Committee—*contd.*

14. The Agricultural Officer, North-West Frontier Province.
15. The Agricultural Officer, Baluchistan.
16. Mr. G. T. Tait.
17. The Imperial Entomologist.
18. The Imperial Mycologist.
19. Sardar Sahib Lal Singh, Fruit Specialist, Punjab.
20. Dr. D. S. Cheema, Horticulturist to Government, Bombay.
21. Dr. P. K. Sen.
22. Rao Sahib K. I. Thadani, Director of Agriculture, Sind.
23. Dr. Hidayatullah, Economic Botanist, Bengal.
24. Diwan Bahadur T. Raghaviah.
25. Mr. P. H. Carpenter.
26. Mr. J. H. Sprott (Coorg).
27. Dr. J. F. Dastur, Mycologist (Central Provinces), Nagpur.
28. Dr. B. N. Uppal, Plant Pathologist to Government, Bombay.
29. Professor S. P. Agharkar, Botany Department, Calcutta University.
30. Mr. Zarbakht Khan, Horticulturist, North-West Frontier Province, Peshawar.
31. Dr. Birbal Sahni, F.R.S.
32. Dr. S. K. Mitra.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio*.

Entomological and Pathological Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research—Chairman.
2. The Agricultural Commissioner with the Government of India.
3. The Director, Imperial Agricultural Research Institute.
4. Lieut.-Colonel E. Cotter, I.M.S., Public Health Commissioner with the Government of India.
5. The Director of Agriculture, United Provinces.
6. The Entomologist to Government, Punjab.
7. Mr. A. M. Mustafa, Agricultural Officer, Baluchistan.
8. The Imperial Entomologist, Imperial Agricultural Research Institute.
9. The Imperial Mycologist, Imperial Agricultural Research Institute.
10. The Director of Agriculture, Kashmir.
11. Sardar Sahib Lal Singh, Fruit Specialist, Lyallpur.
12. Mr. K. R. Narayana Iyer, Director of Agriculture, Travancore.
13. Dr. Hidayatullah, Economic Botanist, Bengal.
14. Dr. A. K. Mitra, Economic Botanist, United Provinces.
15. Khan Bahadur M. Afzal Husain.
16. Professor P. C. Mahalanobis.
17. Dr. J. C. H. Templer, Entomologist.
18. Dr. J. F. Dastur, Mycologist, Nagpur.
19. Dr. B. N. Uppal, Plant Pathologist to Government, Bombay.
20. Mr. P. V. Isaac, Second Imperial Entomologist, Imperial Agricultural Research Institute.
21. Dr. J. A. Muliyil, Biological Control Officer, Imperial Agricultural Research Institute.

Secretary, Imperial Council of Agricultural Research, Secretary, *ex-officio*.

Animal Pests and Diseases Committee.

1. The Vice-Chairman, Imperial Council of Agricultural Research, Chairman, *ex-officio*.
2. The Animal Husbandry Commissioner with the Government of India.

Animal Pests and Diseases Committee—*contd.*

3. The Director, Imperial Veterinary Research Institute, Mukteswar.
4. The Director of Veterinary Services, Madras.
5. The Director of Veterinary Service, Bombay.
6. The Director, Civil Veterinary Department and Veterinary Adviser to the Government of Bengal, Calcutta.
7. The Director of Veterinary Services, United Provinces.
8. The Drector of Veternary Servces, Punjab.
9. The Director of Veterinary Services, Bihar.
10. The Deputy Director of Veternary Servces, Central Provinces and Berar.
11. The Director, Civil Veterinary Department, Assam.
12. The Superintendent, Civil Veterinary Department, North-West Frontier Province.
13. The Director of Veterinary Services, Sind.
14. The Deputy Director of Veterinary Science and Animal Husbandry, Baroda.
15. The Senior Veterinary Inspector, Cochin.
16. The Superintendent, Civil Veterinary Department, Kashmir.
17. The Director of Veterinary Services in India, Army Headquarters, Simla.
18. The Superintendent, Civil Veterinary Department, Mysore.
19. The Director, Civil Veterinary Department, Hyderabad.
20. Mr. S. K. Sen, Entomologist, Imperial Veterinary Research Institute. Mukteswar.
21. Sir C. V. Mehta.
22. Assistant Director of Veterinary Services, Orissa.

Secretary, Imperial Council of Agricultural Research—Secretary, *ex-officio*.

Cardamoms Committee.

1. The Agricultural Commissioner with the Government of India (Chairman).
2—4. The Directors of Agriculture, Madras, Mysore and Travancore.
5. Mr. J. H. Sprott.
6. The Director, Imperial Agricultural Research Institute, New Delhi.
7. Dr. B. N. Uppal, Plant Pathologist to the Government of Bombay.
8. The Imperial Entomologist, Imperial Agricultural Research Institute.
9. Mr. P. H. Carpenter, Director, Scientific Department, Indian Tea Association, Tocklai.
10. Diwan Bahadur T. Raghaviah.
11. Mr. H. C. Javaraya.

APPENDIX V.

Annual Accounts for the year 1939-40 relating to the grant for research purposes.

RECEIPTS.			PAYMENTS.					
Heads of accounts.	Receipts during the year.	Grants.		Head of account.	Expenditure during the year.	Excess — or Savings + over net grant	Remarks.
		Original.	Net.				
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	
1. Opening balance on 1st April 1939	61,661 5 11	2,500	1,700	1. Appointment of the Chief Economic and staff in connection with the investigation into the cost of production of crops in the Principal Sugarcane and Cotton tract in India . . .	1,687 15 0	12 1 0	Inconsiderable.
2. Grants from Central Government for research work :—	...	2,000	3,000	2. Sugar Committee . . .	2,993 0 0	+7 0 0	,,
(i) Annual recurring grant . .	5,00,000 0 0	33,900	20,100	3. Establishment of Research and Testing station for the indigenous system of *gur* and Sugar Manufacture by the Director, Imperial Institute of Sugar Technology	20,131 2 7	—31 2 7	,,
(ii) Grant for Marketing Scheme (Provincial portion).	1,67,000 0 0	530	800	4. United Provinces Sugarcane seedling scheme	780 0 0	+20 0 0	,,
(iii) Special grant from Sugar Excise Fund . . .	2,28 000 0 0	39,600	43,100	5. Sugarcane Research Station in the Bombay-Deccan . . .	43,090 6 0	+9 10 0	,,
		29,500	28,200	6. Establishment of Sugarcane Station in Bihar and appointment of sugarcane specialist . .	28,150 0 0	+50 0 0	,,
(iv) Additional grant . . .	...	13,200	10,800	7. Sub-station of the Coimbatore Imperial Sugar Station at Karnal.	10,780 0 0	+20 0 0	,,
for Coorg enquiry . .	407 10 0	4,900	23,000	8. Research on Mosaic and other cane diseases at the Imperial Agricultural Research Institute.	23,000 0 0	...	,,
3. Grants from Indian States—	...	2,360	2,360	9. Sugarcane Seedling Station at Dacca	2,300 0 0	+60 0 0	,,
(i) Mysore	10,000 0 0	5,900	5,900	10. Breeding thick canes, Mysore. .	5,800 0 0	+100 0 0	,,
(ii) Baroda	5,000 0 0	7,700	2,700	11. Research on Genetics of Sugarcane	2,692 11 0	+7 5 0	,,
(iii) Cochin	5,000 0 0	22,500	5,800	12. Research on Sugarcane, Madras .	5,800 0 0	...	
(iv) Travancore	5,000 0 0	26,900	26,900	13. Sugarcane Research Station, Punjab, ...	26,000 0 0	+900 0 0	,,

3 Grants from Indian States—*contd.*									
(v) Bhopal	2,500	0	0	49,200	49,200	14. Investigations into various problems of sugar industry in the United Provinces . . .	47,600	0 0	+1,600 0 0
(vi) Kashmir	5,000	0	0	3,100	3,100	15. Sugarcane work at the Jorhat Experimental Station, Assam .	3,050	0 0	+50 0 0 ,,
4. Interest from investments and advances—				9,900	5,000	16. Bureau of Sugar Standards . .	5,023	0 0	—23 0 0 ,,
(i) 2½ per cent. loan 1948-52 and 3½ per cent. loan 1947-50 .	30,174	4	0	28,400	45,500	17. Central Sugarcane Insect Pests Scheme	45,525	0 0	—25 0 0 ,,
(ii) 3 per cent. loan 1963-65 . .	49,361	4	0	3,000	1,500	18. Research on structural anatomy of sugarcane	1,500	0 0	... ,,
(iii) Fixed deposits, etc. . .	15,521	2	0						
(iv) Motor car allowance . .	135	8	0	6,400	4,800	19. North-West Frontier Province Sugarcane Scheme . . .	4,800	0 0	... ,,
5. Miscellaneous Receipts—				7,600	6,400	20. Chemistry of Sugarcane scheme .	6,370	0 0	+30 0 0 ,,
(i) Receipts from the Indian Central Cotton Committee in respect of moiety of expenditure on the scheme of investigation into the cost of production of crops in the principal sugarcane and cotton tracts in India	12,318	2	3	2,300 8,000 6200	2,300 ... 2,600	21. Investigation of suitable types of cane for Gujrat . . .	2,300	0 0	... ,,
						22. Utilization of bagasse for paper and board industry . . .	...		...
						23. Manufacture of Cattle feed from molasses	2,590	0 0	+10 0 0 ,,
(ii) Receipts realised by various Provincial Governments from the schemes financed from the funds of the Council . .	40,860	10	2	...	...	24. Planning of Experiments on ratooning of sugarcane—	...		... ,,
				4,910	4,910	(a) United Provinces . .	4,625	0 0	+285 0 0 ,,
(iii) Receipts on account of unspent balances of grants made by the Council to various Provincial Governments, Indian States, private persons and Indian Universities .	5,631	8	6	5,100	3,900	(b) Bihar	3,920	0 0	—20 0 0 ,,
				...	...	25. Research on Insect Pests of Sugarcane—	...		... ,,
				2,800	3,400	(a) Bombay . . .	3,400	0 0	... ,,
(iv) Receipts from the Hide Improvement Fund . . .	75	5	0	11,500	7,200	(b) Bihar	7,230	0 0	—30 0 0 ,,
				11,900	7,500	(c) United Provinces . .	7,450	0 0	+50 0 0 ,,
(v) Other miscellaneous receipts .	908	10	7	28,400	*Nil*	(d) Imperial Agricultural Institute.	2	0 0	—2 0 0 ,,
				4,000	2,800	(e) Orissa	2,800	0 0	... ,,
				4,000	2,000	(f) Mysore	2,000	0 0	... ,,
				8,000	4,000	(g) Bengal	4,000	0 0	... ,,
				4,000	*Nil*	(h) Hyderabad . . .	*nil.*		... ,,
				8,000	8,000	(i) Madras	4,000	0 0	+4,000 0 0 ,,
				nil.	3,000	(j) Indian Statistical Institute . . .	3,000	0 0	... ,,

RECEIPTS.				PAYMENTS.									
Heads of accounts.	Receipts during the year.			Grants.		Head of account.	Expenditure during the year.			Excess— or Savings + over net grant.			Remarks.
				Original.	Net.								
	Rs.	A.	P.	Rs.	Rs.		Rs.	A.	P.	Rs.	A.	P.	
6. Debts and Remittances				*Nil*	6,000	(*k*) Punjab							Inconsiderable.
(i) Refund of loans and advances to Council's servants	1,576	0	0	18,600	16,400	26. Sugar Marketing Survey	6,000	0	0	...			,,
				5,000	*Nil*	27. Reclamation of Alkaline and Usar Lands in the United Provinces with molasses.	16,400	0	0	...			,,
				2,620	1,300	28. Grant to the Punjab Government for Locust Control measures	*Nil*			...			,,
(ii) Deposits and Advances	1,012	6	0										
(iii) Recoveries from the Research staff on account of Income-tax, Provident Fund, etc.	3,886	9	0	15,000	20,500	29. Special staff research work with headquarters at Karachi	1,300	0	0	...			,,
				1,000	*Nil*	30. Locust Committee	20,517	9	4	—17	9	4	,,
				23,000	19,400	31. Statistical Section of the Bureau of Agricultural Intelligence	*Nil*			...			,,
Total receipts	11,51,090	5	5	10,600	7,400	32. Tobacoo Enquiry	19,379	5	3	+20	10	9	,,
				...	...	33. Cinchona Enquiry	7,374	14	9	+25	1	3	,,
				25,700	25,700	34. Botanical Sub-station at Pusa	10	15	9	—10	15	9	,,
				31,000	29,700	35. Grant to the Agra College, Agra, for investigation of rusts of wheat and barley	25,180	4	6	+519	11	6	,,
Receipts on account of repayments of investments and reinvestments	28,72,843	12	0	24,700	24,700	36. Agricultural Meteorology, Poona	29,650	0	0	+50	0	0	,,
				4,000	4,000	37. Appointment of Physical Assistant to the staff of Agricultural Chemist, Bengal	24,716	11	0	—16	11	0	,,
						38. Co-ordinate Schemes of Rice Research—	3,970	0	0	+30	0	0	,,
Grand Total	40,23,934	1	5	6,700	7,300	(*a*) Central Provinces	7,340	0	0	—40	0	0	,,
				13,800	12,300	(*b*) Bihar	12,256	15	6	+43	0	6	,,
				10,100	10,100	(*c*) Assam	10,043	10	9	+56	5	3	,,
				16,100	13,800	(*d*) Bengal	13,800	0	0	...			,,
				10,260	10,260	(*e*) United Provinces	9,656	15	6	+603	0	6	,,
				25,700	16,400	(*f*) Orissa	16,400	0	0	...			,,
						39. Malting and Brewing Tests of Improved Barleys—							
				2,100	3,900	(*a*) United Provinces	3,848	0	0	+52	0	0	,,
				1,000	*Nil*	(*b*) Punjab	*Nil*			...			,,
				1,570	24,500	40. San Jose scale survey in the Punjab which is needed to prevent the pest spreading to other parts of the Punjab, United Provinces and North-West Frontier Province	24,500	0	0	...			,,

16,300	16,300	41. Research in systematic cultivation of medical plants and study of food poisons by Colonel Chopra .	16,220 0 0	+80 0 0		
16,700	15,400	42. Bombay cold storage of fruit scheme	15,376 6 9	+23 9 3		„
		43. Dry-farming research schemes—				
39,800	34,100	(*a*) Bombay-Deccan . .	34,058 5 6	+41 10 6		„
15,060	15,060	(*b*) Ceded Districts of Madras .	15,070 4 0	—10 4 0		„
20,200	17,900	(*c*) South East Punjab . .	17,900 0 0	...		„
11,000	9,300	(*d*) Hyderabad-Deccan . .	9,308 9 0	—8 9 0		„
4,600	8,800	44. Scheme for the improvement of the castor crop in India . .	8,780 0 0	+20 0 0		„
10,100	10,100	45. Potato Breeding Research in Northern India . . .	10,532 0 0	—432 0 0		„
		46. Provincial Schemes of Fruit Research :—				
14,500	14,500	(*a*) Madras	15,046 2 10	—546 2 10		Inconsi-
7,800	4,100	(*b*) Bengal	4,050 0 0	+50 0 0		derable.
28,200	25,300	(*c*) United Provinces . .	25,300 0 0	...		„
7,100	6,000	(*d*) Punjab—fruits and vegetable preservation . . .	6,000 0 0	...		„
10,900	10,900	(*e*) Bihar	10,206 10 9	+693 5 3		„
9,500	6,100	(*f*) Assam	6,100 0 0	...		„
13,200	9,200	(*g*) Central Provinces . .	9,200 0 0	...		„
11,100	9,700	(*h*) Punjab citrus and grape vines	9,700 0 0	...		„
3,700	3,700	(*i*) North West Frontier Province	3,700 0 0	...		„
3,300	*Nil*	(*j*) Hyderabad . . .	*Nil*	...		„
9,400	7,900	(*k*) Mysore				
...	...	(*l*) Baluchistan Fruit Growing Scheme	7,900 0 0	...		„
			0 3 3	—0 3 3		„
5,000	1,700	(*m*) Orissa	1,650 0 0	+50 0 0		„
1,000	1,000	47. Bengal flax fibre scheme . .	1,000 0 0	...		„
18,900	20,100	48. Tobacco Research—Guntur .	20,100 0 0	...		„
13,300	3,300	49. Research on Virus Diseases of plants	3,300 0 0	...		„
		50. Oil seed research schemes—				
10,900	10,900	(*a*) Linseed—Central Provinces .	10,800 0 0	+100 0 0		„
6,400	3,500	(*b*) Linseed—Bengal . .	3,485 0 0	+15 0 0		„
6,000	6,400	(*c*) Rape and mustard—Punjab .	6,350 0 0	+50 0 0		„
9,900	9,000	(*d*) Groundnuts—Madras . .	9,000 0 0	...		„
9,000	9,600	51. Research on diseases of coconut palm in South India . .	9,642 0 0	—42 0 0		„
7,420	5,900	52. Fruit canning and preserving laboratory at Quetta . .	5,920 0 0	—20 0 0		„
		53. Sunn-hemp schemes—				
500	500	(*a*) Madras . . .	533 4 0	—33 4 0		„
2,000	1,400	(*b*) Central Provinces .	1,351 4 0	+48 12 0		„
500	500	(*c*) Bihar	500 0 0	...		„
1,200	600	(*d*) Bombay	630 0 0	—30 0 0		„
5,500	...	54. Scheme for supply of decorticated cotton seed cake for propaganda	*Nil*	...		„

RECEIPTS.		PAYMENTS.					
Heads of accounts.	Receipts during the year.	Grants. Original	Grants. Net.	Head of account.	Expenditure during the year.	Excess — or Savings + over net grant.	Remarks.
	Rs. A. P.	Rs.	Rs.		Rs. A. P	Rs. A. P.	Inconsiderable.
		21,650	11,200	55. Scheme regarding water requirements of crops in the Punjab.	11,160 0 0	+40 0 0	,,
		3,100	2,400	56. Investigation into the attack on jowar by the parasite striga.	2,387 0 0	+13 0 0	,,
		8,300	8,300	57. Research on Cocoanuts, Madura.	8,300 0 0	...	
		8,900	1,800	58. Scheme of Gas Storage of Fruits and Vegetables . . .	1,800 0 0	...	,,
		3,400	3,400	59. Mysore Coffee Research Scheme .	3,450 0 0	—50 0 0	,,
		Nil	150	60. Investigation of India fish poisons and other Indian forest Products for their insecticidal properties .	148 8 1	+1 7 11	
		15,200	10,400	61. Bombay Rust Research Scheme .	10,400 0 0	...	,,
		5,600	3,000	62. San Jose Scale and Wool Aphies Scheme, Kashmir . . .	2,970 0 0	+30 0 0	,,
		5,700	*Nil*	63. Central Province Pan Cultivation Scheme	*Nil*	...	,,
		6,200	7,500	64. Wheat Breeding sub-station, Simla	7,509 4 0	—9 4 0	,,
		2,10,000	1,53,800	65. Provincial marketing schemes .	1,53,656 8 0	+143 8 0	,,
		2,500	*Nil*	66. Bhopal Kans Eradication Scheme	*Nil*	...	,,
		9,860	9,100	67. Dacca University scheme of Agriculture Research . . .	9,095 0 6	+4 15 6	,,
		9,680	9,000	68. Prof. Mukherjee's scheme of research into properties of colloid soil constituents . . .	8,972 14 6	+27 1 6	,,
		11,800	12,500	69. Prof. Mahalanobis's scheme of investigation of experimental errors in field trials . . .	12,454 9 0	+45 7 0	,,
		830	830	70. Investigation on the Organic Constituents of Indian soils by Prof. J. C. Ghosh . .	830 0 0	...	,,

		2,600	7,500	71. Investigation for preparation of cheap synthetic manure from town refuse and waste material by the Indian Institute of Science, Bangalore	7,500	0	0	...		"
		1,100	4,000	72. Extension of work on "Quality" in crops by the Indian Institute of Science	4,004	1	9	—4	1	9
		1,350	1,350	73. Research on nitrogen loss in soils and nitrogen fixation in soils by Dr. N. R. Dhar	1,349	8	0	+0	8	0
		5,700	8,700	74. Research work on Plant Physiology by Dr. Boshi Sen	8,700	0	0	...		"
		500	500	75. Research in Agricultural Economics at the Gokhale Institute of Politics and Economics	510	0	0	—10	0	0
		12,600	12,600	76. Benares University Plant Physiology Scheme	12,600	0	0	...		"
		5,200	2,700	77. Research into Problems of Coastal Soils	2,670	0	0	+30	0	0
		5,200	6,400	78. Dr. Slater's scheme of goat breading, United Provinces	6,400	0	0	...		"
		14,200	14,200	79. Appointment of a Physiological Chemist to study animal nutrition problems at Delhi	13,300	0	0	+900	0	0
				80. Appointment of Veterinary Investigation Officers in :—						
				(a) Hyderabad-Deccan						
				(b) Bombay						
				(c) Bengal						
				(d) Punjab						
		75,000	64,100	(e) Bihar	64,094	15	3	+5	0	9
				(f) Central Provinces						
				(g) Madras						
				(h) United Provinces						
				(i) Assam						
		8,900	8,900	(j) North West Frontier Province	8,522	0	0	+378	0	0
		8,900	7,600	(k) Sind and Ajmer	7,569	0	0	+31	0	0
		10,000	8,200	(l) Orissa	8,200	0	0	...		"
		850	850	81. Research on the composition of milk at the Allahabad Agricultural Institute	850	0	0	...		"
		2,300	*Nil*	82. Investigation of Johne's diseases among cattle in Mysore	*Nil*			...		"
		9,200	9,500	83. Extension of work on animal nutrition, Madras	9,470	0	0	+30	0	0
		6,200	6,200	84. Research on warble flies	6,200	0	0	...		"
		4,000	3,500	85. Investigation of indigenous sheep-breeding, Punjab	3,450	0	0	+50	0	0
		16,900	15,000	86. Feeding of cattle on departmental farms, United Provinces	15,000	0	0	...		"

RECEIPTS.		PAYMENTS.					
Heads of accounts.	Receipts during the year.	Grants.		Head of account.	Expenditure during the year.	Excess — or Savings + over net grant.	Remarks.
		Original.	Net.				
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	
		6,800	5,900	87. Research in Poultry Husbandary in the Bombay Presidency	5,883 6 3	+16 9 9	Inconsiderable.
		5,100	5,100	88. Scheme for the Analysis of foodstuffs for cattle	5,030 0 0	+70 0 0	,,
		1,500	3,600	89. Fresh water fishes scheme, Bengal.	3,610 0 0	-10 0 0	,,
		2,350	2,500	90. Improvement of poultry for table purposes (Punjab)	2,520 0 0	-20 0 0	,,
		7,250	7,600	91. Bombay Sheep Breeding Scheme	7,591 10 0	+8 6 0	,,
		7,000	400	92. Scheme for investigation of Tuberculosis and Johne's disease, Imperial Veterinary Research Institute	392 10 8	+7 5 4	,,
		26,500	14,300	93. Grant to the Imperial Veterinary Research Institute, Mukteswar for the appointment of a research officer and staff for investigation into contagious abortion in cattle, goats and sheep	14,300 0 0	...	,,
		5,900	*Nil*	94. Grant to the Imperial Veterinary Research Institute, Mukteswar for research into diseases of poultry in Bengal	*Nil*	...	,,
		4,400	4,400	95. Enquiry into the helminthiasis of cattle, sheep and goats in the United Provinces	4,434 11 0	-34 11 0	,,
		Nil	400	96. Establishment of pedigree herd books	433 8 0	-33 8 0	,,
		9,400	8,600	97. Appointment of a systematic Protozoologist, Imperial Veterinary Research Institute, Mukteswar.	8,633 3 0	-33 3 0	,,
		8,500	*Nil*	98. Research work in the Anand Creamery in the manufacture of products and by-products of milk	*Nil*	...	,,
		7,000	7,000	99. Scheme for determining the feeding values of certain food grains, oil seeds and cakes etc.	7,000 0 0	...	

		6,300	5,900	100. Punjab Indigenous Goat Breeding scheme	5,850	0	0	+50	0	0	"
		16,100	*Nil*	101. Scheme for the Toxicology of Indian Drugs	*Nil*			...			"
		13,120	*Nil*	102. Deputation to South Africa for study of Angora Goat Industry	*Nil*			...			"
		3,000	2,200	103. Madras Sheep breeding scheme	2,220	0	0	−20	0	0	"
		11,150	2,500	104. Scheme for testing the values of different methods of controlling or eradicating ticks	2,530	0	0	−30	0	0	"
		6,000	6,000	105. Grant for Imperial Dairy Diploma Course	6,000	0	0	...			"
		2,000	1,600	106. Madras Helminthiasis scheme	1,550	0	0	+50	0	0	"
		16,000	*Nil*	107. Assam Animal Nutrition scheme	*Nil*			...			"
				108. Scheme for the formation of milk recording society—							
		450	*Nil*	(*a*) Madras	*Nil*			...			"
		480	600	(*b*) United Provinces	550	0	0	+50	0	0	"
		1,350	1,200	(*c*) Punjab	1,200	0	0	...			"
		500	400	(*d*) Bombay	420	0	0	−20	0	0	"
		...	...	109. Village Enquiry Scheme, Punjab	22	15	0	−22	15	0	
		...	1,000	110. Defining Broad Characteristics of Cattle, Bombay	1,000	0	0	...			"
		10,500	10,500	111. All India Animal Husbandry Bureau	10,850	5	3	−350	5	3	"
		3,800	2,000	112. Scheme for the training of a Scholar in Animal Genitics in the United Kidgdom	1,957	15	2	+42	0	10	"
		700	...	113. Deputation to the 11th World Dairy Congress	...			...			"
		...	4,500	114. Deputation to the International Congress of Genetics Edinburg and to the International Congress of Animal Breeding, Zurich	4,487	4	0	+12	12	0	"
		11,250	5,700	115. Contribution to the International Office of Epizootics, Paris	5,672	0	11	+27	15	1	"
		14,500	...	116. Contribution to International Institute of Agriculture, Rome	...			...			"
		55,700	27,800	117. Contribution to Imperial Agricultural Bureau, London	27,825	0	0	−25	0	0	"
		23,800	11,900	118. Contribution to Imperial Mycological Institute, London, Imperial Institute of Entomology, London and Farnham House Laboratory	11,866	10	8	+33	5	4	"
		4,800	2,400	119. Contribution to Imperial Bureau of Dairy Science	2,362	8	0	+37	8	0	"
		300	150	120. Contribution to British Empire Organization, Coffee Section	140	0	0	+10	0	0	"
		700	700	121. Contribution to Fruit and Vegetable Preservation Station Campden	666	10	8	+33	5	4	"

RECEIPTS.		PAYMENTS.					
Heads of accounts.	Receipts during the year.	Grants. Original.	Grants. Net.	Head of account.	Expenditure during the year.	Excess — or Savings + over net grant.	Remarks.
	Rs. A. P.	Rs.	Rs.		Rs. A. P.	Rs. A. P.	Inconsideration.
		500	500	122. Contribution to Indian Academy of Science, Bangalore . .	500 0 0	...	
		500	500	123. Contribution to National Institute of Science, Calcutta .	500 0 0	...	,,
		...	150	124. Contribution to Tobacco Federation of the British Empire .	133 5 4	+16 10 8	,,
		7,000	5,600	125. Books and Publications . .	5,521 12 6	+78 3 6	
		1,000	400	126. Editorial Committee . . .	383 2 0	+16 14 0	,,
		9,000	8,300	127. Accounts add Audit . . .	8,223 5 0	+76 11 0	,,
		2,000	2,600	128. Miscellaneous.	2,759 0 3	−159 0 3	,,
		9,000	11,000	129. Travelling allowance of non-official members of the Imperial Council of Agricultural Research	10,964 9 0	+35 7 0	,,
		500	100	130. Award of a medal for improvement in Agriculture and Animal Husbandry	65 5 6	+34 10 6	,,
		6,000	14,000	131. T. A. of visitors.	14,076 12 0	−76 12 0	,,
		67,050	2,800	132. Grant for the development of refrigerated rail transport . .	2,781 0 0	+19 0 0	,,
		3,050	1,800	133. Punjab Cold Storage Scheme .	1,800 0 0	...	,,
		3,600	3,700	134. Agricultural and Veterinary Survey in Coorg	3,29 12 0	−29 12 0	,,
		4,500	4,500	135. Scheme regarding study of indigenous veterinary methods	4,317 9 0	+182 7 0	,,
		10,000	5,800	136. ointment of an Assistant Editor of Journals . . .	5,835 4 3	−35 4 3	,,
		1,500	500	137. Deposits and advances repayable .	530 0 0	−30 0 0	,,
		2,500	3,400	138. Remittances of income-tax, provident funds, etc. . . .	3,343 5 0	+56 11 0	,,
				Total Expenditure .	15,11,433 8 6		
				Investment and re-investment in fixed deposit	23,92,843 12 0		
				By Balance . .	1,19,656 12 11		
	40,23,934 1 5			GRAND TOTAL .	40,23,934 1 5		

APPENDIX V—*concld.*

II. Particulars of Advances outstanding at the end of the year :—

Particulars.	*Amount.* Rs. a. p.
(*a*) Permanent advance with Secretary, Imperial Council of Agricultural Research.	250 0 0
(*b*) Permanent advance with Locust Research Entomologist	728 4 0
Total .	978 4 0

III. Particulars of Securities, etc.—	Face value. Rs.	Purchase value. Rs.	A.	P.	(Approximate market value on 31st March 1940).
1. Three per cent. stock, 1963-65 (kept with the Reserve Bank of India, Calcutta) . .	16,49,500	15,54,334	0	0	Rs. 15,45,900 (at Rs. 93-11-0 for Rs. 100).
2. 3½ per cent. stock, 1947-50 (kept with the Reserve Bank of India, Calcutta) . .	5,50,000	5,91,495	1	0	Rs. 5,72,300 (at Rs. 104-1 for Rs. 100).
3. 2½ per cent. stock, 1948-52 (kept with the Reserve Bank of India, Calcutta) . .	4,00,000	4,02,736	9	0	Rs. 3,88,900 (at Rs. 97-3-6 for Rs. 100).
4. Seven fixed deposit receipts Nos. B 05593 B 05599, dated 23rd January 1940 bearing interest at ¼ per cent. and repayable at a week's notice for Rs. 50,000 each . .	3,50,000	3,50,000	0	0	
5. Ten five-year post office cash certificates, dated the 25th September 1935 . . .	10,000	8,625	0	0	

IV. Particulars of closing balance—	
Cash in current account with the Imperial Bank of India, Simla	1,889 15 6
Cash in current account with the Imperial Bank of India, New Delhi . . .	1,17,766 13 5
Total .	1,19,656 12 11

S. BASU,
Secretary,
Imperial Council of Agricultural Research.
New Delhi.

The accounts have been examined and according to the best of my information, and in consideration of the explanations given as a result of the test-audit of the books of the Imperial Council of Agricultural Research, the accounts are correct, subject to the remarks made in my report of June 1940.

B. N. SEN GUPTA,
Examiner,
Outside Audit Department.

APPENDIX VI.

Statement showing expenditure incurred up to the end of 1939-40 on the various research schemes financed by the Council.

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	AGRICULTURAL SCHEMES.				
	A.—Rice.				
1	Botanical Sub-station . .	2,63,930	30-9-40†	2,28,370	35,560
2	Co-ordinated scheme of rice research in Provinces and Constituent States	12,47,450	*	11,60,130	87,320
		15,11,380		13,88,500	1,22,880
	B.—Wheat.				
3	Investigation into rusts of wheat and barley	2,56,480	31-3-40†	2,44,920	11,560
4	Scheme for the production of strains of rust-resistant wheats.	22,050	31-3-41†	14,360	7,690
5	Bombay rust research scheme .	32,040	1943	10,400	21,640
		3,10,570		2,69,680	40,890
	C.—Other Cereals (Barley, Jowar, etc.).				
7	Scheme for testing the malting and brewing qualities of Indian barleys	18,950	31-3-41†	18,910	40
8	Research into the Striga attack on Jowar	21,600	26-5-43	9,320	12,280
		40,550		28,230	12,320

*Bengal	31-3-40†
United Provinces	31-3-42†
Bihar	31-3-40†
Orissa	30-6-40†
Assam	31-3-40†
Central Provinces	31-3-41†

† Since extended.

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	AGRICULTURAL SCHEME—*contd.*				
	D.—Fruit.				
9	Research on the cold and gas storage of fruits, Bombay	1,53,870	29-2-40†	1,37,900	15,970
10	Baluchistan fruit canning and preserving scheme	52,600	1943	26,620	25,980
11	Entomological survey in the Punjab and the North West Frontier Province	68,300	31-3-40	66,210	2,090
12	San Jose Scale Survey scheme, Kashmir	17,760	1942	2,970	14,790
14	Fruit and vegetable research schemes in Madras, Bengal, United Provinces, Punjab, Bihar, Central Provinces, Orissa, Assam, North West Frontier Province, Hyderabad and Mysore	7,21,080	*	5,11,640	2,09,440
		10,13,610		7,45,340	2,68,270
	E.—Fibres.				
15	Investigation into the methods of extraction of flax fibres in Bengal	5,000	31-3-41	4,240	760
16	Investigation into sunnhemp cultivation in (*i*) Madras, (*ii*) Bombay, (*iii*) Bihar and (*iv*) Central Provinces	15,630	(*i*) 7-4-40† (*ii*) 1-1-40 (*iii*) 10-1-42 (*iv*) 3-1-41	11,000	4,630
		20,630		15,240	5,390

*Madras 28-2-40†
Bengal 31-3-40†
United Provinces 8-7-40†
Punjab 1941
Bihar 3-4-40†
Central Provinces 29-4-42
Assam 6-9-43
Orissa 13-11-42
North West Frontier Province 1943
Hyderabad 1943
Mysore 1943

† Since extended.

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40.
1	2	3	4	5	6
	AGRICULTTURAL SCHEME—*contd.*	Rs.		Rs.	Rs.
	F.—Oilseeds.				
17	Hyderabad castor crop research scheme	61,050	31-3-40*	51,850	9,200
18	Groundnut research in Madras	57,100	21-1-42	33,890	23,210
19	Linseed research in Bengal	21,880	30-9-41	13,990	7,890
20	Rape and mustard research in the Punjab	36,070	31-8-41	24,250	11,820
21	Linseed research in the Central Provinces	52,280	9-2-42	30,580	21,700
22	Scheme for the supply of decorticated cotton-seed cake for educative propaganda	10,000	November, 1940	3,300	6,700
23	Research on coconuts in the Madras Presidency	43,040	14-9-'43	13,300	29,740
24	Investigation of the "Root" disease of the coconut palm in South India	29,880	31-3-40*	25,970	3,910
		3,11,300		1,97,130	1,14,170
	G.—Coffee.				
25	Mysore coffee research scheme	9,500	1942	3,450	6,050
		9,500		3,450	6,050
	H.—Potatoes.				
26	Potato breeding research in Northern India	92,430	31-3-40*	90,580	1,85
		92,430		90,580	1,850
	J.—Tobacco.				
27	Research on cigarette tobacco at Guntur	1,05,920	August, 1941	78,850	27,070
28	Training of officers in tobacco cultivation and research	25,500	1940-41	10,010	15,490
		1,31,420		88,860	42,560

* Since extended.

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	AGRICULTURAL SCHEME—*contd.*				
	J.—Pan Cultivation.				
29	Research on Pan cultivation in the Central Provinces . .	19,200	30-4-45	..	19,200
		19,200		..	19,200
	K.—Soil Studies.				
30	Grant to the Dacca University for research on lateritic soils and nutrition of rice plant .	91,770	30-6-40*	85,730	6,040
31	Research into the properties of colloid soil constituents . .	81,370	31-10-43	47,100	34,270
32	Scheme for the appointment of a physical assistant on the staff of the Agricultural Chemist, Bengal	34,890	30-6-40*	31,470	3,420
33	Investigation into the organic constituents of Indian soils .	11,200	10-11-39*	10,410	790
34	Scheme regarding the preparation of cheap synthetic manure from town refuse and waste materials	15,480	31-3-40*	14,400	1,080
35	Research on the water requirements of crops in the Punjab .	71,400	31-1-43	11,160	60,240
36	Research on coastal soils . .	15,310	1942	2,670	12,640
		3,21,420		2,02,940	1,18,480
	L.—Plant Physiology.				
37	Research on plant physiology by Dr. Boshi Sen	24,130	31-10-41	16,920	7,210
38	Research in the physiology of cane and wheat at the Benares Hindu University . . .	67,920	31-3-42	44,500	23,420
		92,050		61,420	30,630

*Since extended.

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40
1	2	3	4	5	6
	AGRICULTURAL SCHEME—*contd.*	Rs.		Rs.	Rs.
	M.—Crop Protection.				
	(i) Locusts.				
39	Special locust research scheme .	7,01,080	31-3-40*	6,97,600	3,480
40	Locust Committee . . .	4,980	1940-41	3,980	1,000
		7,06,060		7,01,580	4,480
	(ii) Plant Diseases.				
41	Investigation of virus diseases of plants	80,470	1944	27,090	53,380
		80,470		27,090	53,380
	N.—Dry Farming.				
42	Research schemes in Madras, Bombay, Punjab and Hyderabad	5,90,320	1940*	5,28,790	61,530
		5,90,320		5,28,790	61,530
	O.—Insecticides and Medicinal Plants.				
43	Scheme regarding the systematic cultivation of medicinal plants and study of food poisons by Col. Chopra	76,060	April 40*	70,400	5,660
		76,060		70,400	5,660
	P.—Miscellaneous.				
44	Scheme regarding statistical studies and experimental errors in field trials	97,220	30-6-42*	63,880	33,340
45	Research on agricultural meteorology	1,79,780	1940-41	1,65,220	14,560
46	Scheme for the establishment of a Statistical Section of the Bureau of Agricultural Intelligence	1,43,060	30-11-40*	1,26,310	16,750
47	Scheme regarding eradication of Kans grass	5,000	1942	..	5,000
		4,25,060		3,55,410	69,650
	Total Agricultural Schemes .	57,52,030		47,74,640	9,77,390

* Since extended.

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	ANIMAL HUSBANDRY SCHEMES.				
	A.—Animal Pests and Diseases and Cure.				
1	Appointment of veterinary investigation officers	7,10,880	31-3-40*	6,25,260	85,620
2	Investigation of Johne's disease among cattle in Mysore	23,460	31-7-40*	20,400	3,060
3	Research on warble flies	29,170	31-12-41	14,270	14,900
4	Investigation of tuberculosis and Johne's disease among animals.	1,02,200	1944	390	1,01,810
5	Investigation into contagious abortion in cattle, goats and sheep	76,720	24-5-42	14,300	62,420
6	United Provinces helminthiasis scheme	21,160	9-2-42	12,130	9,030
7	Scheme for the appointment of a systematic protozoologist at the Imperial Veterinary Research Institute	40,200	17-8-41	28,240	11,960
8	Research on the control of ticks in the Bombay Presidency	35,700	14-1-42	7,530	28,170
9	Research into the indigenous drugs of India with special reference to their toxicology	39,000	1942	..	39,000
10	Inquiry into the helminthiasis of cattle in the Madras Presidency	10,100	31-5-44	1,550	8,550
		10,88,590		7,24,070	3,64,520
	B.—Cattle Feeding (Animal Nutrition).				
11	Practical research into feeding of cattle on departmental farms	1,01,520	April, 1943	37,800	63,720
12	Scheme regarding feeding of minerals to cattle in Bihar	25,470	30-9-41	17,220	8,250

* Since extended.

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	B.—Cattle Feeding (Animal Nutrition)—contd.				
13	Scheme for determining the feeding values of certain food grains, oil seeds and cakes for working bullocks and dairy cattle .	22,840	31-3-'42	7,000	15,840
14	Animal nutrition scheme, Dacca.	1,35,860	31-12-'41	99,030	36,830
15	Animal nutrition scheme, Madras.	49,930	31-3-'40‡	43,390	6,540
16	Animal nutrition scheme, Assam.	45,000	1942	..	45,000
		3,80,620		2,04,440	1,76,180
	C.—Cattle Breeding.				
17	Scheme for defining breed characteristics of cattle . . .	2,000	1940-41	1,000	1,000
18	Training of a scholar in animal genetics in the United Kingdom	9,100	1941	2,700	6,400
		11,100		3,700	7,400
	D.—Goat and Sheep Breeding.				
19	Dr. Slater's scheme of goat breeding	63,190	5-6-'41‡	57,560	5,630
20	Indigenous sheep breeding scheme Punjab	43,000	October 1946	13,640	29,360
21	Bombay sheep breeding scheme .	76,390	31-10-'47	28,430	47,960
22	Madras sheep breeding scheme .	18,000	22-10-'43	5,020	12,980
23	Punjab goat breeding scheme .	18,720	October, '44	5,850	12,870
24	Deputation of an officer to South Africa to study the Angora goat breeding industry . . .	13,120	1940	..	13,120
		2,39,420		1,10,500	1,21,920
	E.—Dairying.				
25	Research at the Anand creamery into the manufacture of products and bye-products of milk*	95,860	..	3,230	92,630

‡ Since extended.

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	E.—Dairying—contd.				
26	Grant for the continuance of the Indian Dairy Diploma Course .	12,000	1940	10,500	1,500
27	Scheme regarding the formation of milk-recording societies . .	5,850	1941-42	2,220	3,630
		1,13,710		15,950	97,760
	F.—Poultry				
28	Poultry husbandry scheme, Bombay	43,740	30-9-'41	34,490	9,250
29	Research in the improvement of poultry for table purposes in Northern India . . .	12,370	November, '42.	4,650	7,720
30	Research into the diseases of poultry	37,500	1943-44	..	37,500
		93,610		39,140	54,470
	G.—Fish				
31	Research in fresh water fishes in Bengal	10,470	30-11-'40‡	8,620	1,850
		10,470		8,620	1,850
	H.—Skins and Hides				
32	Experiments regarding mechanical flaying of hides . . .	1,300	1940-41	..	1,300
		1,300		..	1,300
	I.—Animal Husbandry Bureau				
33	All-India animal husbandry bureau	65,420	10-4-'42	45,030	20,390
		65,420		45,030	20,390
	Total Animal Husbandry Schemes	19,97,240		11,51,450	8,45,790

‡ Since extended.

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	GENERAL SCHEMES.				
	A.—Contributions to International and Imperial Bureaux of Agriculture and Veterinary Research and Indian Institute of Science.				
1	Contribution to the International Office dez Epizzootics, Paris .	63,910	1944-45	29,880	34,030
2	Contribution to the International Institute of Agriculture . .	1,90,690	1942-43	1,32,690	58,000
3	Contribution to the Imperial Agricultural Bureaux . .	1,39,130	1941-42	55,650	83,480
4	Contribution to the Imperial Institute of Mycology . . .	59,330	1941-42	23,730	35,600
5	Contribution to the ImperialInstitute of Entomology . .				
6	Contribution towards maintenance of the Farnham House Laboratory				
7	Contribution to the Imperial Bureau of Dairy Science . .	11,820	1941-42	4,730	7,090
8	Contribution to the Fruit Preservation Research Station, Campden.	2,000	1940-41	1,330	670
9	Contribution to the International Dairy Federation . . .	500	..	..	500
10	Grant to the Indian Academy of Sciences, Bangalore . .	3,000	1940-41	2,500	500
11	Grant to the National Institute of Sciences of India, Calcutta .	3,000	1940-41	2,500	500
		4,73,380		2,53,010	2,20,370
	B.—Headquarters Miscellaneous Schemes, etc.				
12	Books and Publications . .	84,400	1941-42	64,890	19,510
13	Editorial Committee . . .	4,080	Standing charges.	4,080	*Nil.*
14	Accounts and Audit . . .	81,570		81,570	*Nil.*
15	Travelling allowance of non-official members of the Council	63,010		63,010	*Nil.*
16	Travelling allowance of visitors for attending meetings of the Advisory Board and the Committees of the Council . .	59,200		59,200	*Nil.*
17	Award of medals for improvements in agriculture and animal husbandry	1,850	1941-42	670	1,180
18	Editorial staff for the 'Indian Farming'	13,700	6-8-'40‡	5,840	7,860
19	Miscellaneous	14,790	Standing charge.	14,790	*Nil.*
		3,22,600		2,94,050	28,550
	Total General Schemes . .	7,95,980		5,47,060	2,48,920

‡ Since extended.

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	SUGAR SCHEMES.				
	A.—Testing, Agricultural and Manurial Experiments.				
1	Examination and study of sugarcane seedlings at Shahjahanpur	11,230	August, 41	10,550	680
2	Bombay-Deccan sugarcane research scheme . . .	5,10,600	5-6-'40‡	4,71,230	39,370
3	Establishment of a research station in Bihar and appointment of a sugarcane specialist .	3,10,250	17-3-'40‡	2,86,630	23,620
4	Scheme for the establishment of a sub-station of the Coimbatore Imperial Sugarcane Station at Karnal	1,48,110	31-3-'40‡	1,10,370	37,740
5	Sugarcane seedling testing station, Dacca	24,850	11-11-'41	19,120	5,730
6	Madras sugarcane research scheme	1,47,130	31-3-'40‡	1,24,730	22,400
7	Sugarcane research station, Punjab	1,69,000	31-3-'40‡	1,61,340	7,660
8	Investigation into various problems of sugar industry in the United Provinces . . .	1,60,020	31-3-'40‡	1,52,940	7,080
9	Extension of sugarcane work at the Jorhat experimental station, Assam	57,600	31-3-'40‡	57,550	50
10	Sugarcane research in the North West Frontier Province . .	63,750	1-1-'45	6,600	57,150
11	Scheme regarding manufacture of cattle feed from molasses .	24,670	31-3-'41‡	12,630	12,040
12	Planning of experiments on ratooning of sugarcane in (*i*) United Provinces and (*ii*) Bihar	59,000	(*i*)31-12-'43 (*ii*)18-3-'44	17,050	41,950
13	Scheme regarding the reclamation of alkline and Usar lands in the United Provinces . . .	5,000	14-1-'41‡	..	5,000
	"	16,91,210		14,30,740	2,60470
	B.—Technology, Gur-making, etc.				
14	Establishment of a research and testing station for the indigenous system of gur and sugar manufacture by the Director, Imperial Institute of Sugar Technology .	1,67,380	30-11-'41‡	1,23,940	43,440
15	Scheme or a bureau of sugar standards	32,610	†	21,200	11,410
		1,99,990		1,45,140	54,850

† Scheme since taken over by Government. Provision made for adjustment of receipts realised from the scheme.

‡ Since extended.

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	C.—Sugarcane Pests and Diseases.				
16	Research on mosaic and other cane diseases	1,45,880	31-3-'40‡	1,44,010	1,870
17	Research on insect pests of sugarcane	3,14,640	31-3-'40‡	1,60,480	1,54,160
		4,60,520		3,04,490	1,56,030
	D.—Morphology, Cytology, Canebreeding and Genetics.				
18	Grant to Mysore Darbar for breeding thick canes . . .	32,560	31-3-40‡	29,180	3,380
19	Research on the genetics of sugarcane	43,650	31-3-'40‡	38,650	5,000
20	Research on the morphology and anatomy of sugarcane sorghum hybrids and of the Indian sugarcane	8,600	4-8-'40	6,760	1,840
21	Research on the chemistry of sugarcane	23,000	4-5-'41‡	14,610	8,390
22	Investigation of suitable types of cane for Gujrat . . .	11,300	31-10-'41	8,200	3,100
		1,19,110		97,400	21,710
	E.—Marketing Survey.				
23	Sugar marketing survey scheme .	47,000	28-2-'41	39,590	7,410
		47,000		39,590	7,410
	F.—Miscellaneous.				
24	Scheme regarding the utilization of bagasse for paper and board industry	15,000	Non-recurring grant.	11,000	4,000
25	Sugar Committee . . .	45,400	Standing charge.	45,400	*Nil.*
		60,400		56,400	4,000
	Total Sugar Research Schemes .	25,78,230		20,73,760	5,04,470

‡ Since extended

Serial No.	Name of Scheme	Sanctioned grant	Date of termination	Actual expenditure up to end of 1939-40	Balance available after 1939-40
1	2	3	4	5	6
		Rs.		Rs.	Rs.
	MARKETING SCHEME.				
1	Provincial marketing scheme .	10,00,000	31-3-'41‡	9,38,190	61,810
		10,00,000		9,38,190	61,810
	COLD STORAGE SCHEME.				
1	Cold storage scheme . . .	1,00,000	1941-42	32,910	67,090
		1,00,000		32,910	67,090
	Total—				
	Agriculture	57,52,030	..	47,74,640	9,77,390
	Animal Husbandry . . .	19,97,240	..	11,51,450	8,45,790
	General	7,95,980	..	5,47,060	2,48,920
	Sugar	25,78,230	..	20,73,760	5,04,470
	Marketing	10,00,000	..	9,38,190	61,810
	Cold Storage	1,00,000	..	32,910	67,090
	Total schemes in progress . .	122,23,480	..	95,18,010	27,05,470
	Total completed schemes* . .	24,49,570	..	24,49,540	30†
	Grand Total . . .	146,73,050	..	119,67,550	27,05,500

* Schemes completed before 1st April 1940.
† Paid during 1940-41.
‡ Since extended.

APPENDIX VII.

Financial resources of the I. C. A. R. and allocation of funds upto 31st March 1940.

Funds received and receivable 1929-30 to 1939-40.		Funds allotted.	
Particulars.	Amount.	Particulars.	Amount.
	Rs.		Rs.
1. Grants from Central Govt.—		I.—Schemes in progress.	
(*i*) General . . .	83,60,800		
(*ii*) Sugar . . .	31,42,200		
(*iii*) Marketing . .	10,00,000		
(*iv*) Cold Storage . .	1,00,000	*Agricultural Schemes.*	
2. Contribution from constituent States . . .	3,72,500	1. Rice	15,11,380
3. Miscellaneous income, receipts and recoveries .	20,70,300	2. Wheat	3,10,570
		3. Other cereals (Barley, Jowar, etc.)	40,550
		4. Fruit	10,13,610
		5. Fibres	20,630
		6. Oilseeds	3,11,300
		7. Coffee	9,500
		8. Potatoes	92,430
		9. Tobacco	1,31,420
		10. Pan cultivation. . .	19,200
		11. Soil studies . . .	3,21,420
		12. Plant physiology . .	92,050
		13. Crop protection . .	7,86,530
		14. Dry farming . . .	5,90,320
		15. Insecticides and medicinal plants	76,060
		16. Miscellaneous . . .	4,25,060
		Total Agricultural Schemes.	57,52,030
		Animal Husbandry Schemes.	
		1. Animal pests and diseases and cure . . .	10,88,590
		2. Cattle feeding (Animal nutrition).	3,80,620
		3. Cattle breeding . . .	11,100
		4. Goat and sheep breeding .	2,32,420
		5. Dairying	1,13,710
		6. Poultry	93,610
		7. Fish	10,470
		8. Skins and hides . . .	1,300
		9. Animal husbandry bureau .	65,420
		Total Animal Husbandry Schemes . . .	19,97,240
		Other General Research Schemes.	
		1. Contributions to International and Imperial Bureaux, etc.	4,73,380
		2. Headquarters miscellaneous schemes . . .	3,22,600
		Total Other General Schemes .	7,95,980

Funds received and receivable 1929-30 to 1939-40.		Funds allotted.	
Particulars.	Amount.	Particulars.	Amount.
	Rs.		Rs.
		I.—Schemes in progress—*contd.*	
		Sugar Research Schemes.	
		1. Testing, agricultural and manurial experiments	16,91,210
		2. Technology, gur-making, etc.	1,99,990
		3. Sugarcane pests and diseases	4,60,520
		4. Morphology, cytology, cane-breeding and genetics	1,19,110
		5. Marketing survey	47,000
		6. Miscellaneous	60,400
		Total Sugar Schemes	25,78,230
		Marketing.	
		1. Provincial marketing scheme	10,00,000
		Cold Storage.	
		1. Cold storage scheme	1,00,000
		Total schemes in progress	122,23,480
Total	1,50,45,800	II.—Completed Schemes	24,49,570
		Grand Total	146,73,050
		Unallotted balance	3,72,750
		Total	1,50,45,800

APPENDIX VIII.

ACT No. XXVII OF 1940.

[PASSED BY THE INDIAN LEGISLATURE.]

(Received the assent of the Governor General on the 15th April, 1940.)

An Act to make better financial provision for the Imperial Council of Agricultural Research.

WHEREAS it is expedient to make better financial provision for the carrying out by the Imperial Council of Agricultural Research of the objects for which it is established as set forth in the Memorandum of Association of that body, and for this purpose to impose on certain articles a cess by way of customs duty on export, the proceeds of which shall be paid to the said Council:

It is hereby enacted as follows:—

Short title and extent.

1. (*1*) This Act may be called the Agricultural Produce Cess Act, 1940.

(*2*) It extends to the whole of British India.

Definitions.

2. In this Act, unless there is anything repugnant in the subject or context,—

(*a*) "Collector" means a Customs-collector as defined in clause (*c*) of section 3 of the Sea Customs Act, 1878, or a Collector of land Customs as defined in clause (*c*) of section 2 of the Land Customs Act, 1924, as the case may be, and VIII of 1878. XIX of 1924.

(*b*) "Council" means the Imperial Council of Agricultural Research.

Imposition of cess.

3. (*1*) A customs duty at the rate of one-half of one per cent. *ad valorem* shall be levied on all articles included in the Schedule which are exported from British India:

Provided that the said duty shall not be levied on articles proved to the satisfaction of the Collector not to have been produced in India.

(*2*) The Central Government may, by notification in the official Gazette, fix for the purposes of levying the said duty tariff values of any articles included

in the Schedule, and may alter any tariff values for the time being in force.

Power to exclude articles from Schedule.

4. The Central Government may, after previous consultation with the Council, by notification in the official Gazette, direct that any article specified in the Schedule shall cease to be subject to the duty imposed by section 3, and thereupon, so long as the notification remains in force, that article shall be deemed not to be included in the Schedule.

Refund of, and exemption from, cess.

5. The Central Board of Revenue may make rules providing, on such conditions as may be specified in the rules, for—

(*a*) the refund of duty levied where articles are exported by land and subsequently imported into India, and

(*b*) the export by land, without payment of the duty, of articles which are subsequently to be imported into India.

Payment of cess to Council and expenditure of cess by Council.

6. (*1*) The proceeds of the duty levied under this Act reduced by the cost of collection as determined by the Central Government shall be paid to the Council.

(*2*) The amount so due shall be paid by the Central Government to the Council at intervals of not more than six months.

(*3*) The expenditure of the money so paid to the Council shall be subject to such limitations as may be imposed by rules made in this behalf by the Central Government.

Standing Finance Committee.

7. (*1*) The Council shall constitute a Standing Finance Committee, of which one member shall be chosen from among the representatives of the Central Legislature on the governing body of the Council, and one member shall be an officer appointed by the Central Government.

(*2*) Subject to the provisions of sub-section (*1*), the constitution, functions and procedure of the Standing Finance Committee shall be regulated in such manner as the Council may with the previous approval of the Central Government determine.

Reserve fund.

8. The Council shall in accordance with the rules made in this behalf by the Central Government create and maintain a reserve fund.

Power of Central Government to make rules.

9. (*1*) The Central Government may, after consultation with the Council, by notification in the official Gazette, make rules to carry out the purposes of this Act.

(*2*) In particular and without prejudice to the generality of the foregoing power, the Central Government may make rules regulating the expenditure of the money paid to the Council under section 6 and providing for the creation, maintenance and management of the reserve fund referred to in section 8.

(*3*) All rules made under this Act shall be laid before both Chambers of the Central Legislature as soon as may be after they are made.

THE SCHEDULE.

(*See* section 3.)

1. BONES.
2. BRISTLES.
3. BUTTER.
4. CEREALS, other than Rice and Wheat.
5. DRUGS.
6. FIBRE for brushes.
7. FISH.
8. FRUITS.
9. GHEE.
10. HIDES, raw.
11. MANURES.
12. OILCAKES.
13. PULSES.
14. SEEDS.
15. SKINS, raw.
16. SPICES.
17. TOBACCO, unmanufactured.
18. VEGETABLES.
19. WHEAT.
20. WHEAT FLOUR.
21. WOOL, raw.

APPENDIX IX.

List of Scientific and Technical Officers paid from the research grant of the Imperial Council of Agricultural Research as on 31st March 1940.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
I. C. A. R.					
1. *Locust Research Scheme*	Locust Research Entomologist to the Imperial Council of Agricultural Research, Karachi.	Rao Bahadur Y. Ramchandra Rao, M.A., F.R.E.S.	13th December 1930.	On foreign service, lent by the Madras Agricultural Department.	Transferred to New Delhi from 10th February 1939.
2. *Statistical—Field Experiment*	Statistician . .	Mr. S. S. Iyer, B.A., F.S.S. .	2nd January, 1940	Officiating.	
	Statistical Assistant . .	Mr. M. K. Bose, M.A.	2nd January 1940.	Officiating.	
	Agricultural Assistant .	Mr. S. Raja Ram, B.Sc.(Ag.).	5th February 1940	Direct appointment..	
3. *Animal Husbandry Bureau* .	Technical Assistant . .	Mr. K. P. R. Kartha, B.A. .	10th April 1932 .	Direct appointment.	
4. *Cold Storage Scheme* . .	Assistant Marketing Officer	Mr. C. L. Barves, B.E.(Mech.)	12th September 1939.	Direct appointment .	
IMPERIAL INSTITUTE OF SUGAR TECHNOLOGY.					
1. Bureau of Sugar Standards .	Chemist . . .	Mr. N. C. Verma, B.Sc., A.H.B.T.I.	11th March 1935	By selection.	
2. Cattle Feed Scheme . .	Assistant Chemist . .	Mr. C. Parthasarathy, B.Sc. (Ag).	20th March 1940	By selection.	
3. Sugar Research and Testing Station (Bilari).	Chemist	Mr. K. C. Joshi, B.Sc. Dip. Tech.	5th May 1937 .	By selection.	
	Engineer . . .	Mr. S. K. Mukherjea . .	29th January 1938	By selection.	
Scheme for the Improvement of Agricultural Marketing in India —Sugar Marketing Survey.	Marketing Officer . .	Mr. Triyugi Prasad, M.A., LL.B.	1st December 1937	Selected from applications received for the post which had been advertised.	
	Assistant Marketing Officer	Mr. K. P. Jain, B.Sc. . . .	1st December 1937		
	Ditto . .	Mr .H. S. Lodi, B.A. . .	1st December 1937		
IMPERIAL AGRICULTURAL RESEARCH INSTITUTE, NEW DELHI.					
1. Botanical Sub-Station, Pusa	1. Superintendent . .	Mr. R. D. Bose, B.Sc.. .	15th May 1936. .	By transfer from the Botanical section of the Institute.	
	2. Assistant	Vacant	...	...	Steps have been taken to recruit a candidate.
2. Sugarcane Sub-Station, Karnal.	1. Superintendent . .	Mr. T. R. Venkataraman, B.A.	17th March 1940	By promotion from the Department.	
	2. Technical Assistant .	Vacant	...	...	Steps have been taken to recruit a candidate.

Name of Scheme	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
IMPERIAL AGRICULTURAL RESEARCH INSTITUTE, NEW DELHI—*contd.*					
3. Scheme for research on Mosaic and other diseases of sugarcane.	1. Plant Pathologist .	Dr. B. L. Chona, M.Sc., Ph.D.	23rd March 1936	Through the Federal Public Service Commission.	
	2. Assistant Sugarcane Mycologist.	Mr. L. S. Subramaniam .	23rd June 1933 .	Through the Federal Public Service Commission.	
	3. Research Assistant .	Mr. R. P. Malik, B.Sc. (Agri.)	16th March 1940	By selection.	
4. Scheme for research on Genetics of Sugarcane at the Imperial Cane Breeding Station, Coimbatore.	1. Geneticist . . .	Vacant	...	...	Steps have been taken to recruit a candidate through the F. P. S. C.
5. Scheme for Potato breeding in Northern India.	1. Superintendent . .	Mr. Pushkarnath, M.Sc., Assoc. I.A.R.I.	1st April 1935 .	By selection from P. G. students of the Institute.	
	2. Assistant . . .	Mr. M. L. Khanna, B.Sc. .	1st August 1936 .	By selection from the list of candidates recommended by Principals of Agricultural Colleges.	
6. Scheme for Wheat Rust Research, Simla.	1. Assistant . .	Mr. S. Z. Hasnain, M.Sc., Assoc. I.A.R.I.	17th December 1937.	Selected from applications received for the post which had been advertised.	
	2. Junior Assistant . .	Mr. S. D. Misra, M.Sc., Assoc. I.A.R.I.	15th November 1938.	Selected from applications received for the post which had been advertised.	
7. Tobacco Research Sub-station, Guntur.	1. Superintendent . .	Mr. T. Narayana Rao, M.A. Assoc. I. A. R. I.	23rd March 1938	By transfer from the Madras Agri. Department.	
	2. Assistant Entomologist	Mr. C. K. Samuel, B.Sc.	10th August 1936	By transfer from the Entomological Section of the Institute after inviting applications by advertisement.	
8. Scheme for Research on Insect Pests of Sugarcane.	1. Biological Control Res. Officer.	Dr. J. A. Mulyil, B.A., Ph.D.	26th April 1938 .	Through Federal Public Service Commission.	
	2. Assistant . . .	Mr. T. V. Venkatraman, M.Sc.	27th August 1936	Selected from applications received for the post which had been advertised.	
	3. Assistant . . .	Mr. K. V. Rao, B.Sc., Assoc. I.A.R.I.	4th September 1936.	Selected from applications received for the posts which had been advertised.	
	4. Assistant . . .	Mr. Tazimul Haq, B.Sc., (Agri.).	5th March 1938 .	Selected from applications received for the posts which had been advertised.	
	5. Assistant . . .	Mr. K. Lakshmanan, B.Sc. (Agri.).	1st March 1937 .	Selected from applications received for the post which had been advertised.	

	6. Assistant . . .	Mr. Prabhakar Rao, M.Sc.	1st September 1938.	Selected from applications received for the posts which had been advertised.	
	7. Assistant . . .	Dr. Ram Mohan Rao, M.Sc., D.Sc.	13th June 1939 .		
	8. Assistant . . .	Mr. Faizul Ghani Khan, M.Sc.	17th May 1939 .		
9. Scheme for Research on Chemistry of Sugarcane.	1. Assistant Sugarcane Chemist.	Mr. S. C. Chaudhuri, M. Sc.	7th March 1938 .	Through Federal Public Service Commission.	
	2. Assistant . . .	Mr. K. V. S. Satyanarayana, B.Sc. (Ag.) Assoc. I.A.R.I.	1st April 1938 .	By selection from P. G. students of the Institute.	
IMPERIAL VETERINARY RESEARCH INSTITUTE, MUKTESAR.					
1. Protozoological scheme .	Systematic Protozoologist	Dr. H. N. Ray, M.Sc. (Cal.), Ph. D. (Lond.).	18th August 1936	Recruited through the Public Service Commission.	
2. Warble Fly scheme . .	(i) Entomological Assistant.	Mr. B. N. Soni, B.Sc., (Punjab) and B.Sc. (Agri.) (Edin.)	1st January 1937	Recruited by the Director, Imperial Veterinary Research Institute.	
	(ii) Veterinary Inspector	Mr. Mustaq Ahmed Khan, G.C.V.C.	21st January 1939	Recruited by the Director, Imperial Veterinary Research Institute.	
3. Investigation of Tuberculosis and John's disease among animals.	Veterinary Bacteriologist .	Mr. Lakshmi Sahai . .	..	Recruited by the Government of India.	At present undergoing training in England.
4. Research into the diseases of Poultry.	Research Officer . .	Mr. S. Ganapaty Iyer	..	Recruited through the Federal Public Service Commission.	Proceeded to England on the 10th February 1939 for training.
5. Scheme for the investigation into contagious abortion of cattle, sheep and goats.	(i) Research Officer .	Mr. J. B. Polding, B.Sc., M.R.C.V.S.	25th May, 1939 .	Recruited by the Government of India.	
	(ii) Veterinary Inspector .	Mr. Ruhal Ameen, G.B.V.C.	3rd October, 1939	Recruited by the Director, Imperial Veterinary Research Institute.	
	(iii) Laboratory Assistant, Lower Grade.	Mr. Haider Khan . .	16th June, 1939 .	Recruited by the Director, Imperial Veterinary Research Institute.	
MADRAS.					
1. Veterinary Investigation Scheme.	Veterinary Investigation Officer, Madras.	Sir G. R. Viswanathan, G.M.V.C., Post Graduate, Muktesswar; Post Graduate training in the United Kingdom.	13th April 1933 .	Transferred from the Department.	
	Assistant to the Veterinary nvestigation Officer, Madras.	Sri S. Venkatarama Ayyar, G.M.V.C.	20th September, 1939.		
2. Madras Sheep Breeding Scheme	Assistant Farm Manager (Sheep).	Sri P. K. Krishnan Nambiyar, Certificate of proficiency in Agriculture.	23rd October 1938	Transferred from the Madras Agricultural Department.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
MADRAS—*contd.*					
3. Madras Helminthiasis Scheme	Research Scholar . . .	M. Anantaraman, M.A., M.Sc.	27th November 1939.	Recruited direct.	
	Assistant to the Helminthology Research Scholar.	S. N. Vaidyanathan, G.M.V.C.	23rd September 1939.	Transferred from the Department.	
4. Milk Recording Scheme .	Milk Recorder . . .	M. V. Krishna Rao, G.M.V.C.	3rd January 1940		
5. (*a*) Sugarcane Research at Anakapalle.	Farm Manager . .	Sri M. Lakshmi Kantham, B.Sc., Ag.	16th May 1938 .		
	Botany Assistant . .	Sri P. Sitaramayya, B.Sc., Ag.	7th April 1937		
(*b*) Sugarcane Research at Gudiyattam.	Farm Manager . .	Sri P. S. H. Narayanaswamy Naidu, B. Sc., Ag.	30th July 1937 .		
	Botany Assistant . .	Sri S. Ramaswamy Ayyar, B.Sc., Ag.	11th May 1933 .	Transferred from the Department.	
	Farm Manager . .	Sri C. Ekambaram, B.Sc., Ag. Underwent training in Animal Husbandry and Dairying at Pusa.	16th June 1935		
6. Dry Farming Scheme, Hagari	Superintendent, Dry Farming Station, Hagari.	Sri C. Vijyayaraghava Acharya L.Ag.	14th April 1934 .		
	Assistant in Plant Physiology.	Sri V. Panduranga Rao, M.A. (Bot. & Zool.) M.Sc. (Nebraska). Underwent special training in plant Physiology at Nebraska, U. S. A. at the cost of the I. C. A. R.	1st October 1935	Through the Madras Public Service Commission.	
	Assistant for Millets .	Sri P. Seshadri Sarma, B.Sc., Ag.	7th May 1934 .		
		Sri P. Krishnaswamy, B.Sc., Ag.	31st October 1936	Transferred from the Department.	
	Assistant to Soil Physicist	A. Abdul Samad Sahib, B.A. (Phy. & Chem.) B.Sc., Ag.	7th May 1934 .		
7. Fruit Research Station Anantarajupet.	Superintendent . .	Sri K. C. Naik, B.Ag. (Bombay) M.Sc. (Bristol).	3rd August 1935 .	Through the Public Service Commission.	
	Farm Manager . .	Sri V. S. Ranga Charlu, B.Sc. Ag.	8th September 1939	Transferred from the Department.	

8 Marketing Scheme	Assistant Marketing Officers	Sri K. W. Chakrapani Marar, L.Ag.	25th February 1935.	Transferred from the Department.
		Sri S. N. Venkataramana Ayyar, B.A. (Physics and Chemistry), B.Sc., Ag. Underwent statistical training at Calcutta.	21st February 1935.	
		Sri M. P. Kunhikutti, L.Ag. Underwent post graduate course in Animal Husbandry and Dairying.	23rd February 1935.	
9. Animal Nutrition Scheme .	Assistants . . .	Sri Y. V. Narayana Ayyar B.A., B.Sc., (Ag.).	19th June 1935 to 1st November 1939.	
		Sri A. Mariakulandai, B.Sc., Ag.	1st November 1939.	
		Sri S. Varadarajan, B.Sc. Ag.	19th June 1935 .	
		Sri K. M. Krishna Menon, B.Sc. Ag.		
		Sri C. Balasubrahmanyam, B.A., B.Sc., Ag.	16th September 1935.	
10. Groundnut Research Scheme, Tindivanam.	Superintendent . .	Sri C. R. Seshadri, B. A., B.Sc., Ag.	5th February 1939	
	Assistant . . .	Sri M. Bhavani Shankar Rao, B.Sc., Ag.	22nd January 1937	
	Assistant . . .	Sri M. M. Krishna Marar, B.Sc., Ag.	February 1939 .	
11. Coconut Research Scheme, Kasargod.	Superintendent . .	Sri G. Venkatanarayana, B.Sc., Ag.	15th September 1938.	
	Botanical Assistant . .	Sri S. D. S. Albuquerque, B.Sc., Ag.		
	Botanical Assistant . .	Sri P. M. Sayeed Sahib, B.Sc., Ag.	26th September 1938.	
	Chemical Assistant . .	Sri C. T. Ittyachan, B.Sc., Ag.	15th September 1938.	
12. Scheme for extension of work on insect pests of sugarcane.	Assistant in Entomology at Anakapalle.	Mr. P. Israel, M. A. . .	9th March 1939 to 11th September 1939.	
		Sri C. Krishnamoorthy, B.Sc., Ag.	11th September 1939 to 15th January 1940.	
	Assistant in Etomology at Gudiayattam.	Sri K. Brahmachari, M.A. (Zool. and Bot. L.T.	9th March 1939 .	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BOMBAY.					
1. Investigation of diseases in livestock and their treatment.	Veterinary Investigation Officer, Bombay.	Mr. R. N. Naik, G.B.V.C.	27th June 1932 .	Recruited through the Public Service Commission (India).	
2. Scheme for the control of ticks.	Incharge Cattle Dipping Tank, Turkewadi, district Belgaum.	...	28th January 1939	.....	Tanks placed I/C of the nearest Veterinary Assistant Surgeons *viz.*, Veterinary Assistant Surgeons at Belgaum, Bagalkot and Haveri, respectively.
	Incharge, Cattle Dipping Tank, Benkatti, district Bijapur.	...	25th April 1939 .		
	Incharge Cattle Dipping Tank, Devgiri, district Dharwar.		6th February 1940		
	Incharge, Spraying Operations, Kinulpari, district Sholapur.	Mr. V. S. Deo, G.B.V.C. . Mr. S. V. Sakhadeo, G.B.V.C.	26th March 1939 to 24 September 1939.	Seconded from the Bombay Civil Veterinary Department.	With effect from 4th February 1940 and 24th February 1940, spraying plants placed I/c of the nearest Veterinary Assistant Surgeons, *viz.*, the V. A. Ss. at Sholapur and Kumta.
	Incharge, Spraying operations, Hosakuli, district North Kanara.	Mr. G. A. Hardikar, G.B.V.C.	25th September 1939 to 3rd February 1940. 10th October 1939 to 23rd February 1940.		
3. Sugarcane Cane Research Scheme for the Deccan, Padegaon.	Principal Agricultural Officer.	Mr. V. V. Gadgil, B.Ag. .	24th November 1938.	Deputed from the Bombay Agricultural Department.	
	Crop Physiologist . .	Dr. R. D. Rege, M.Sc. (Bom.), Ph.D. (London).	6th July 1932 .	Recruited through the Board of Selection appointed by the Government of Bombay.	
	Soil Physicist . . .	Dr. J. K. Basu, M.Sc. (Cal.), Ph. D. (Lond).	18th June 1932 .	Recruited through the Board of Selection appointed by the Government of Bombay.	
	Agricultural Overseers .	Mr. V. N. Apte, B.Ag. (Bom.)	18th December 1931.	Deputed from the Bombay Agricultural Department.	
		Mr. N. B. Patwardhan, B.Ag. (Bom.).	1st March 1932 .	Deputed from the Bombay Agricultural Department.	
		Mr. P. S. Kulkarni, B.Ag. (Bom.).	15th October 1932.	Deputed from the Bombay Agricultural Department.	
		Mr. P. B. Wagle, M.Ag. (Bom.).	1st March 1932 .	Deputed from the Bombay Agricultural Department.	
		Mr. S. K. Sannabhadti, B.Ag. (Bom.).	1st September 1935.	Deputed from the Bombay Agricultural Department.	

		Mr. S. S. Sirur, B.Ag.(Bom.).	5th August 1932.	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.
		Mr. V. D. Tagare, B.Ag. (Bom.), B.Sc. (Bom.).	13th August 1932	Recruited by the Director of Agriculture, Bombay Presidency.
4. Dry Farming Research Scheme.	Chief Investigator, Dry Farming Research Scheme, Sholapur.	Mr. N. V. Kanitkar, M.Ag., B.Sc.	1st October 1933	Deputed from the Bombay Agricultural Department.
Main-centre, Sholapur .	Assistant Investigator, Dry Farming Research Scheme in charge of Soil Section.	Dr. V. N. Gokhale . .	23rd December 1936.	Deputed from the Bombay Agricultural Department.
	Senior Assistant in Charge of Plant Section.	Mr. R. B. Gode, M.Sc.	18th October 1933	Transferred from the scheme financed from the funds of the Indian Central Cotton Committee.
	Superintendent, Dry Farming Research Scheme, Main-centre.	Mr. G. M. Bapat, M.Ag. .	1st October 1933	Deputed from the Bombay Agricultural Department.
	Senior Assistant in Plant Section.	Mr. D. H. Gokhale, M.Ag.	12th October 1933	Recruited by the Director of Agriculture, Bombay Presidency.
	Junior Assistant in Soil Section.	Mr. Y. S. Rane, B. Ag.	1st October 1933.	Recruited by the Director of Agriculture, Bombay Presidency.
Sub-centre, Bijapur . .	Superintendent, Dry Farming Research Scheme, Sub-centre, Bijapur.	Mr. K. D. Gomaste, B. Ag. .	Do. .	Deputed from the Bombay Agricultural Department.
	Junior Assistant at Bijapur.	Mr. G. B. Badami, B.Ag. .	2nd October 1933.	Recruited by the Director of Agriculture, Bombay Presidency.
5. The Cold Storage Research Scheme.	Senior Research Assistant .	Dr. D. V. Karmarkar, M.Sc. (Bom.), Ph.D. (Bristol), A.I.I.Sc.	1st March 1934 .	Recruited by the Director of Agriculture, Bombay Presidency.
	Junior Research Assistant.	Mr. B. M. Joshi, M.Sc. . .	1st March 1934 .	Deputed from the Bombay Agricultural Department.
	Senior Mechanic . .	Mr. N. S. Soman, B.E. .	12th August 1939	Recruited by the Director of Agriculture, Bombay.
	Junior Mechanic . .	Mr. K. S. Kahlon . .	1st November 1933	
6. Scheme for improvement of marketing in India.	Assistant Marketing Officers	Mr. A. K. B. Kazi, B.Ag., B.Sc. (Edin), N.D.D., D.I.C.	1st September 1937.	Deputed from the Bombay Agricultural Department.
		Mr. N. V. Bhagawt, B.Ag. .	5th April 1935 .	Ditto.
		Mr. B. H. Patil, B.Ag. .	8th July 1935 .	Ditto
		Mr. B. P. Deshpande, M.Ag. .	5th April 1935 .	Ditto.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BOMBAY—*contd.*					
7. Sheep breeding Scheme	Manager	Mr. S. S. Khot, B.Ag.	1st November 1937	Deputed from the Bombay Agricultural Department.	
8. Scheme of investigation into the Striga attack on jowar.	Striga investigator	Mr. S. Solomon, B.Ag. (Bom.) M.Sc. (Bom.).	27th January 1939.		
9. Virus Diseases Scheme	Assistant Plant Pathologist.	Dr. M. C. Desai, B.Ag. (Bom.) Ph.D.	1st April 1939	Recruited by the Government of Bombay after advertising through the Federal Public Service Commission.	
	Assistant Entomologist	Mr. P. M. Verma, M.Sc.	1st June 1939		
	Agricultural Overseer	Dr. S. P. Capoor	13th July 1939	Recruited by the Director of Agriculture, Bombay, and approved by the I. C. A. R.	
BENGAL.					
10. Rice Research Scheme	Rice Research Officers	Babu Suresh Chandra Chakravarty, B.Sc., L.Ag.	1st June 1932	Promoted from the Department.	
		Babu Kshitish Chandra Banerjee, B.A., L.Ag.	1st June 1932	Promoted from the Department.	
	Assistants	Babu Jnan Ranjan Pal, B.Ag.	1st June 1932	Rercuited by the Department.	
		Babu Ajit Kumar Chakravarty, M.Sc.	November 1938	Recruited by the Department.	
2. Animal Nutrition Scheme	Physiological Chemist	Babu Indu Bhusan Chatterjee, L.Ag.	2nd January 1932	Promoted from the Department.	
	Assistant Chemist	Mr. Md. Abdul Hye, M.Sc.	2nd January 1932	Recruited by the Department.	
3. Scheme for Physical and Chemical Research into soils.	Physical Assistant	Babu Manindra Nath Chakladar, M.Sc.	1st June 1932	Recruited through Public Service Commission (India).	
4. Scheme for establishing sugarcane seedling testing station in Bengal.	Field Assistant	Babu Surendra Nath Bhattacharjee.	22nd July 1935	Recruited by the Department.	
5. Horticultural Scheme in Bengal	Horticultural Officer	Mr. V. N. Vadhawkar, B.Ag.	9th April 1934	Recruited through the Public Service Commission (India).	
6. Scheme for Appointment of marketing staff in Bengal.	Senior Marketing Officer	Mr. A. R. Malik, M.A., B.Sc., (Edin.).	7th February 1935	Promoted from the Department.	

	Assistant Marketing Officers	Babu Kshitish Chandra Guha, B.Sc. (Edin.).	5th August 1935 .	Promoted from the Department	Of the 4 posts of Assistant Marketing Officers 2 remained vacant owing to reversion of the incumbents of the posts to the Agriculture Department with effect from 1st March 1940.
		Moulvi Abdul Wahab Mollah, L. Ag.	20th July 1935 .	Promoted from the Department	
7. Scheme for the Appointment of a Veterinary Investigation Officer in Bengal.	Veterinary Investigation Officer.	Mr. B. Singh, G.B.V.C. .	15th July 1936 .	Recruited by the Government of India, Department of Education, Health and Lands, from the staff of the Imperial Veterinary Research Institute, Muktesar.	
8. Linseed Scheme . .	Analytical Chemist . .	Dr. Sunil Behari Sen Gupta, M.Sc.	8th November 1937.	Recruited by the Department.	
10. Sugarcane Insect Pest .	Assistant . . .	Mr. A. B. De . . .	1st January 1940.	Recruited by the Department.	
11. Scheme for systematic cultivation of medicinal plants and study of food poisons.	1. Botanist . . .	Mr. R. L. Badhwar, M.Sc. .	13th April 1935 .	Recruited by the Department.	
	2. Experimental Assistant	Dr. N. N. Das, M.Sc., M.B. .	13th April 1935 .	Ditto	2. Service terminated on 29th February 1940 due to abolition of the post.
	3. Chemist . . .	Mr. A. C. Ray, M.Sc. . .	10th September 1939.	Ditto.	
	4. Compilers . . .	Mr. N. C. Goswami, M. Sc. .	1st October 1937	Ditto.	
		Mr. Shamlal Nayar, M.Sc. .	13th December 1937.	Ditto.	
UNITED PROVINCES.					
1. Rice Research Scheme . .	Assistant Paddy Specialist	Mr. P. S. Gupta, M.Sc. (Lkw.) M.Sc. (London).	1st March 1940 .	Federal Public Service Commission.	
	Farm Superintendent .	Mr. Sanjai Singh (2) years course Agricultural College, Cawnpore.	1st March 1935 .	Promoted from Department.	
	Research Assistants . .	1. Mr. N. P. Chowdhry, M.Sc.	18th March 1940	Temporarily appointed.	
		2. Mr. M. P. Singh, M.Sc. .	3rd February 1940	Temporarily appointed.	
2. Research into development of the fruit Industry in the hills in U. P.	Soil Chemist . . .	Mr. Narendra Kumar Das, M.Sc., Asso. I.A.R.I.	17th February 1938	Federal Public Service Commission.	
	Horticulturist . . .	Mr. R. S. Singh (Reading) L.Ag.	10th July 1934 .	Federal Public Service Commission.	
	Mycologist . . .	Mr. Udai Bhan Singh, M.Sc. .			
	Entomologist . . .	Mr. Ram Narain Singh, L.Ag.			
	Assistant Horticulturist .	Mr. G. D. Bhat, B.Ag. .	10th July 1934 .	Direct appointment.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
UNITED PROVINCES—*contd.*					
3. Investigation into the problem of Sugar Industry in U. P.	Cane Physiologist .	Dr. R. N. Mathur, M.Sc., Ph.D., D.I.C.	15th January 1934	Direct appointment.	
	Cane Entomologist . .	Mr. B. D. Gupta, M.Sc. .	15th January 1934	Promoted.	
	Cane Agronomist .	Mr. Rama Rao Panji . .	Not yet joined .	Federal Public Service Commission.	
	Research Assistant . .	1. Mr. Shankar Saran, B.Sc., M.Sc.	Not yet joined .	Appointment from the Departmental list.	
	Chemical Assistant . .	2. Har Shankar Pd. Verma, M.Sc.	22nd December 1939.	Appointment rom the Departmental list.	
	Research Assistant . .	3. Mr. D. C. Agarwal, L.Ag. .	15th January 1934	Promoted from department.	
4. U. P. Marketing Scheme .	Assistant Marketing Officers	1. Mr. P. L. Gaur, B.Sc. .	12th June 1935 .	Federal Public Service Commission.	
		2. Mr. Shri Ram Singh .	1st June 1935 .		
		3. Mr. Pati Ram Kala .	5th June 1935 .		
5. Cattle Feeding Scheme	Research Officer . .	Mr. N. C. Das Gupta, B.Sc. .	11th April 1938 .	Federal Public Service Commission.	
	Research Assistants . .	Dr. Sudhir Kunwar Mukherji, M.Sc., D. Phill.	10th December 1938.	Public Service Commission.	
		Dr. Radha Raman Agarwal, M.Sc., Ph.D.	15th December 1938.		
	Chemical Assistant .	Mr. Hanuman Pd. Srivastava, B.Sc., Ag.	14th May 1939 .		
	Farm Assistant . .	Mr. Gyan Sarup Datta, B.Sc., A.H.B.T.I.F.I.I., S.T.	12th December 1938.		
6. Insect Pest Scheme . .	Entomologist Assistants .	Mr. Ram Lal Gerg, B.Sc., Post Graduate.	1st January 1939 .	Public Service Commission.	
		Dr. Shyam Sunder Lal Pradhan, M.Sc., D.Sc.	1st January 1939.		
7. Ratooning Scheme .	Assistant Cane Agronomist	Mr. Guru Pd. Kapur, B.Sc., M.Sc.	1st January 1939.		
	Entomologist Assistant .	Mr. Ram Lal Gupta, M.Sc. .	1st April 1939 .		

8. Milk Recording Scheme				
9. Milk Recording Scheme	Milk Recorder	Pt. Pooran Chand Pandey, I.D.D.	14th August 1939.	
10. Veterinary Disease Investigation Scheme.	Veterinary Investigation Officer.	P. G. Pande, Esq., M.Sc., M.R.C.V.S.	26th April, 1933	Through Public Service Commission of India.
11. Helminthiasis Scheme	Research Assistant	Dr. Bipin Bihari Sinha, D.Sc.	11th February 1937	Recruited direct from the Department.
12. Improvement of goats in the United Provinces.	Assistant Manager	Sardar Singh Bhatia, I.D.D. (Hons.).	15th October 1931	Appointed direct on recommendation of Dr. Sam Higginbotham, Principal, Allahabad Agricultural Institute.
PUNJAB.				
1. Sugarcane Research Scheme	Sugarcane Specialist	S. Harbans Singh, B.Sc. (Agri.) (Punjab).	11th November 1934.	Promoted from the Department on the recommendations of the Public Service Commission.
	Agricultural Assistants, A. Class.	Ch. Khushi Muhammad, B.Sc. (Agri.).	13th December 1934.	
		Bh. Atom Singh Kochhar, B.Sc. (Agri.).	1st February 1934	
		Bh. Balbir Singh, B.Sc. (Agri.)	1st February 1934	
		B. Badri Nath, B.Sc. (Agri.)	6th July 1939	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.
		Bh. Hardial Singh Guram, B.Sc. (Agri.)	21st August 1934	
2. Locust Research Scheme	Agricultural Assistants, A. Class.	Mr. Mohammad Siddiq, B.Sc.	1st June 1939	
		M. Abdul Haq, B.Sc. (Agri).	9th August 1933.	
3. Fruit and Vegetable Preservation Scheme.	Assistant Fruit Biochemist.	Dr. Girdhari Lal, B.Sc. (Pb.), Ph.D., D.I.C. (London).	8th November 1936.	Promoted from the Department by the Punjab Government.
	Senior Research Assistant	M. Mohammad Ishaq, B.Sc. (Agri.)	23rd April 1937	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.
	Junior Research Assistant	L. Nagina Lal Jain, M.Sc.	11th September 1939.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
PUNJAB—*contd.*					
4. Scheme for Improvement of Marketing in India.	Assistant Marketing Officer (Fruit).	S. Pritam Singh Diol, M.Sc. (Agri.) Mich. (U. S. A.).	15th March 1935 .	Promoted from the Department by the Punjab Government.	
	Assistant Marketing Officer (Livestock).	L. Harjas Rai, L.V.P. (Punjab).	15th March 1935.		
	Assistant Marketing Officer (Oilseeds).	Sh. Mohd. Sharif Qureshi, B.Sc. (Agri.) (Punjab).	21st May 1939 .		
	Assistant Marketing Officer (Development).	Dr. Arjan Singh Mallah, B.Sc. (Agri.) (Pub.), Ph.D. (Aberysturith).	2nd May 1939 .		
	Agricultural Assistant, A. Class.	Bh. Partap Singh, B.Sc. (Agri.).	10th May 1937	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
5. Dry Farming Research Scheme.	Agriculturist . .	L. Tehl Ram	1st July 1935 .	Promoted from the Department by the Punjab Government.	
	Soil Physicist . . .	L. Sukh Dayal, M.Sc. (Pb.). .	1st July 1935 .	Promoted from the Department on the recommendations of the Public Service Commission.	
	Plant Physiologist . .	Mr. I. M. Rao, M.A., M.Sc. (Madras).	14th March 1936.	Recruited through the Federal Public Service Commission (India).	
	Agricultural Assistants, A. Class.	M. Mohammad Afzal, B.Sc. (Agri.).	1st July 1935 .	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.	
		L. Girdhari Lal . . .	1st July 1935 .		
		L. Lekh Raj Dhingra .	1st December 1937.		
6. Citrus Stock Scheme . .	Assistant Horticulturist .	Dr. Sham Singh, B.Sc. (Agri.) (Pb.), Ph.D. (Bristol)	11th November 1936.	Promoted from the Department by the Punjab Government.	

	Agricultural Assistants, A Class.	Bh. Sangat Singh, M. Sc. (Agr.)	7th June 1939	
		Bh. Dayal Singh Johar, M.Sc.	1st October 1936	
7. Oilseeds Research Scheme	Agricultural Assistants, A. Class.	M. Sultan Ahmed, B.Sc. (Agri.).	1st November 1936.	
		Dr. Swan Lal Sikka, Ph.D.	1st September 1939.	
		L. Hans Raj Sud, B.Sc. (Agri.)	1st December 1939	Appointed by Director of Agriculture, Punjab, who is competent to make the appointment.
8. San Jose Scale Scheme	Agricultural Assistants, A. Class.	L. Asa Nand B.Sc. (Agri).	3rd April 1937	
		M. Atiqur Rahman, M.Sc. (Agri.).	1st April 1937	
9. Cold Storage Scheme	Agricultural Assistant, A. Class.	Bh. Harbans Singh, B.Sc. (Agri.).	5th April 1937	
10. Scheme for Poultry for table purposes.	Agricultural Assistant, A. Class	M. Abdul Hamid Khan, M.Sc.	14th March 1938	
		L. Hari Krishan, B.Sc. (Agri.)	21st November 1937.	
11. Appointment of a Veterinary Investigation Officer in the Punjab.	Veterinary Investigation Officer.	Mr. Wali Mohd. Khan, B.Sc., M.R.C.V.S.	16th September 1937.	Appointed by the Imperial Council of Agricultural Research on the recommendations of the Punjab Government.
12. Investigation of indigenous sheep breeding at the Government Cattle Farm, Hissar.	Veterinary Assistant Surgeon.	Bh. Gurbaksh Singh, L.V.P.	15th August 1936	Promoted from the Department.
13. Scheme for determining the feeding value of certain food grains, etc.	Agricultural Assistants, A. Class.	(1) Sh. Abdul Hamid, M.Sc.	16th October 1939	Appointed by the Director of Agriculture, Punjab, who is competent to make the appointment.
		(2) M. F. R. Mahmood Ali, M.Sc.	1st April 1939	
		(3) L. Yashpal Neb, B.Sc. (Agri.).		
14. Scheme for water requirements of crops.	Extra Assistant Director of Agriculture.	L. Nathu Ram, L.Ag. (Lyallpur).		Promoted from the Department by Punjab Government.
	Agricultural Assistants, A. Class.	Bh. Balwant Singh Atwal, B.Sc. (Agri.).	1st February 1940.	
		L. Manohar Lal, M.Sc.		
		Dr. N. D. Yusaf, Ph.D.	16th February 1940	Appointed by Director of Agriculture, who is competent to make the appointment.
15. Insect Pest of Sugarcane Scheme.	Ditto	M. Mohd. Shafi Sarvar, M.Sc.	1st May 1939.	
		Dr. Abdul Rahman Ranjha, Ph.D.		
	Agricultural Assistant, B. Class.	Bh. Partap Singh Cheema, B.Sc. (Agri.).	6th July 1939	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BIHAR.					
1. Rice Research Scheme* (extension sanctioned for three years from 20th January 1937).	Rice Specialist . .	Mr. M. Mahbub Alam, M.Sc. (Lucknow).	20th January 1932	Deputed from the Bihar Agricultural Department.	Economic Botanist deputed to work as Rice Specialist from the 20th January 1932.
	Assistant Botanist . .	Mr. Awadh Behari Saran, M.Sc.	24th April 1939 .	Appointed by Local Government.	*The scheme was first sanctioned for five years from 20th January 1932.
	Senior Research Assistants	Mr. M. Anwarul Aziz Khan, B.Sc. (Agra).	24th April 1939 .	Appointed by the D. A., Bihar.	
		Maulavi R. H. Naqui, B.Sc. (Agri.).	24th April 1939 .	Appointed by the D. A., Bihar.	
	Junior Research Assistants	Babu Sachindra Kumar Ray, B.Ag. (Cawnpore). Vacant.	24th April 1939 .	Appointed by the D. A., Bihar.	
	Fieldmen	Mr. H. C. Varma . .	16th July 1933 .	Appointed by the D. A., Bihar.	
		Mr. L. P. Sinha . . .	1st June 1932 .	Appointed by the D. A., Bihar.	
		Mr. Leslie Jones, B.Sc. .	31st January 1938	Appointed by the D. A., Bihar.	
	Senior Plant Collectors .	Mr. M. Mohsin Akhtar .	1st March 1932 .	Appointed by the D. A., Bihar.	
		Babu Kapildeo Prasad Sinha, I.Sc. (Pat.).	7th February 1938	Appointed by the D. A., Bihar.	
	Junior Plant Collectors .	M. Shamsuddin . . .	1st June 1932 .	Appointed by the D. A., Bihar.	
		Babu Brijnandan Prasad .	21st March 1936 .	Appointed by the D. A., Bihar.	
2. Sugarcane Research Scheme.* (Extension sanctioned for 3 years from 18th March 1937.)	Sugarcane-Specialist .	Mr. K. L. Khanna, B.Sc. (Agri.) (Punjab).	18th March 1932	Recruited through the P. S. Commission (India).	*The scheme was first sanctioned for five years from 18th March 1932.
	Physiological Assistant .	Vacant			
	Chemical Assistant . .	Mr. Sailesh Chandra Sen, M.Sc.	23rd December 1933.	Recruited through the P. S. Commission (India).	
	Botanical Assistant . .	Mr. Rama Rao Panje, M.A., M.Sc., (Madras).	2nd January 1934	Recruited through the P. S. Commission (India).	

	Botanical Assistant	Mr. S. L. Sharma, M.Sc.	6th November 1937.	Recruited through the P. S. Commission (India).
	Field Assistant	Mr. P. B. Bhattacharjee, M.Sc.	3rd January 1940.	Appointed by the D. A., Bihar.
	Overseer	Babu Sudhanshu Chandra Ghosh.	17th April 1934	Appointed by the D. A., Bihar.
	Fieldman	Babu Jamuna Prasad Choudhary.	1st July 1937	Appointed by the D. A., Bihar.
	Artist	Maulvi Saiyed Akhtar Hossain	1st July 1937	Appointed by the D. A., Bihar.
	Statistical Assistant	Mr. T. B. Bose, M.Sc.	6th October 1939	Appointed by the D. A., Bihar.
	Sardar	Ranjit Koeri	17th April 1934	Appointed by the D. A., Bihar.
3. Ratooning scheme (sanctioned for 5 years from 19th March 1939).	Agricultural Assistant	Babu Kamalbas Prasad (certificate course, Sabour).	27th March 1940	Promoted from the Department
	Entomological Assistant	Babu Tirtha Prasad Sinha Choudhury, B.Ag.	25th March 1939	Promoted from the Department.
	Laboratory Attender	Babu Ramuchit Sharma	24th March 1939	Appointed by the D. A., Bihar.
	Counter	Babu Ram Singhan Prasad	15th September 1939.	Appointed by the D. A., Bihar.
	Counter	Babu Rajdeo Prasad	25th March 1939	Appointed by the D. A., Bihar.
4. Scheme for the extension of work on Insect pest in Bihar (sanctioned for 2½ years from 9th April 1939).	Fieldmen	Babu Akhileswari Prasad Sinha (I.Sc.).	18th April 1939	Appointed by the D. A., Bihar.
		Babu Ganesh Prasad (I.Sc.) (B.A.).	18th April 1939	Appointed by the D. A., Bihar.
	Laboratory Keeper	Manog Prasad	3rd May 1939	Appointed by the D. A., Bihar.
	Laboratory Keeper	M. A. Ishaque	17th May 1939	Appointed by the D. A., Bihar.
	Laboratory Keeper	Punadeo Tewari	15th June 1939	Appointed by the D. A., Bihar.
5. Fruit Research Scheme (sanctioned for 5 years from 3rd April 1934). (Extension sanctioned for one year from 3rd April 1939).	Physiological Botanist in-charge of the scheme.	Dr. Pabitra K. Sen, Ph.D. (London), M.Sc. (Cal.), D. I. C.	2nd September 1937.	Through the P. S. Commission (India).
	Botanical Assistant	Mr. Provas Chandra Malik, M.Sc.	24th May 1937	Appointed by the D. A. Bihar.
	Biochemical Assistant	Mr. P. K. Roy, M.Sc	3rd January 1940	Appointed by the D. A. Bihar.
	Research Assistant	Babu B. D. Ganguly, B. Ag. (Cawnpore).	7th February 1939	Promoted from the Department.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
BIHAR—*contd.*					
6. Marketing Scheme, Bihar (sanctioned for 5 years from 13th March 1935).	Senior Marketing Officer .	(*a*) Mr. B. N. Sarkar, L.Ag. (Sabour).	13th March 1935	Appointed by the Local Government.	(*a*) Paid by the Government of Bihar.
	Junior Marketing Officers .	Mr. Promod Ranjan Hansdah Acharjee, M.A., B.Sc. (Michigan).	1st June 1935 .	Through the Public Service Commission (India).	
		Mr. Manilal Harinarayan Jani, B.Sc. (Edin.), N. D. D.	28th May 1935 .	Through the Public Service Commission (India).	
		Mr. Premchandra Verma, B. Sc., Ag.	24th May 1935 .	Through the Public Service Commission (India).	
7. Scheme for the analysis of Indigenous fodders in Bihar (sanctioned for 5 years from 1st October 1936).	Chemical Assistants . .	Babu Shiva Kumar Narayan, M.Sc. (Lucknow).	1st October 1936	Appointed by the Director of Agriculture, Bihar.	
		*Maulavi Zafar Ahmad, M.Sc. (Pat.) A. H. B. T. I. (Cawnpore).	1st October 1936	Appointed by the Director of Agriculture, Bihar.	* Appointed to act as Senior Scientific Assistant, Chemical Section from 1st April 1938.
		M. Syed Abdul Ali, M.Sc. (offg.).	1st November 1939	Appointed by the Director of Agriculture, Bihar.	
	Laboratory Assistant .	Babu Bishombhar Jha, I.Sc. (Pat.).	3rd September 1938.	Appointed by the Director of Agriculture, Bihar.	
8. Sunn-hemp scheme (sanctioned for 3 years from 4th January 1938).	Assistant . . .	Vacant.			
9. Veterinary Disease Investigation Scheme.	Veterinary Investigation Officer.	Mr. H. R. Kapur, M.R.C.V.S.	17th February 1940	Appointed temporarily by the Proivncial Government.	

CENTRAL PROVINCES AND BERAR.					
1. Investigation of animal diseases in the Province.	Veterinary Investigation Officer.	Mr. Bachan Singh, M.R.C.V.S	20th June 1932 .	Recruited through the Public Service Commission.	
2. Scheme for the improvement of Rice cultivation in the Central Provinces.	Botanist	Mr. B. B. Dave, L.Ag., M.Sc. (Agr.).	1st September 1932.	Selected from the Department by the Public Service Commission.	Holds charge of the Scheme.
	Assistants . . .	Mr. R. G. Joglekar, B.Ag., Post-Graduate, Pusa.	18th November 1932.	Recruited locally.	
		Mr. H. P. Misra, B.Ag. .	18th November 1934.		
3. Scheme for the improvement of Marketing in India.	Assistant Marketing Officers	Mr. A. X. Rebello, B.Ag. .	5th February 1935	Seconded from the Department of Agriculture, Central Provinces.	
		Mr. R. N. Gadre, L.Ag. .	1st December 1937		
		Mr. K. R. Dubey, B.Ag. .	8th November 1937		
		Mr. B G. Khandekar B., Ag..	4th November 1938.		
		Mr. C. N. Kelkar, G.B.V.C. Asso., I.D.I. (Bangalore).	24th July 1939 .	Seconded from the Veterinary Department, Central Provinces.	
4. Sunn-hemp Research Scheme	Research Assistant . .	Mr. R. D. Mukerji, B.Ag. .	11th January 1937	Recruited locally.	
5. Oilseeds Research Scheme .	Oilseed Specialist . .	Dr. R. H. Richharia, M.Sc., Ph.D. (Cantab.).	10th February 1937.	Recruited through the Public Service Commission.	Holds charge of the Scheme.
	Assistants . . .	Mr. D. P. Persai, B.Ag. .	5th July 1937 .	Recruited locally.	
		Mr. D. R. Dhodapkar, B.Ag.	7th July 1937 .		
6. Citrus Research Scheme .	Horticulturist . . .	Miss Rajul Raoji Bhai Shah, B.Ag., M.Sc. (Mich.).	30th April 1937 .	Recruited through the Public Service Commission.	(Served with 6 month's notice with effect from 1st April 1940).
		Mr. Jaideo Jha, M.Sc. .	8th January 1940	Recruited locally.	Services dispensed with from 30th April 1940.
		Mr. P. R. DeshPande, M. Sc	5th January 1940		
		Mr. K. R. Harshe, M.Sc. .	4th January 1940		
ASSAM.					
1. Investigation of animal diseases in Assam.	Veterinary Investigation Officer, Assam.	Mr. V. R. Gopala Krishnan, G.M.V.C., P.G. (Muktesar).	9th September 1939.	Through Federal Public Service Commission.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
ASSAM—*contd.*					
2. Sugarcane Research Scheme .	Chemical Assistant . .	Mr. Hemendra Nath Pal, M.Sc. (Chemistry).	3rd October 1939.	Appointed by the Director of Agriculture.	
	Assistant Manager . .	Mr. Shamsur Rahman .	...	...	
	Economic Botanist . .	Mr. P. M. Ganguli . .	...	...	
	Farm Manager . .	Mr. B. R. Dutta, B.Ag.	...	...	
3. Deep Water Paddy Farm, Habiganj.	Botanical Assistant . .	Mr. Jitendra Lal Sen, B.Ag.	...	...	
4. Citrus Fruits Research Station.	Horticultural Assistant .	Mr. S. C. Bhattacharya, B. Ag.	...	...	
	Field Assistant . .	Mr. S. Dutta . . .	...	...	
5. Agricultural Marketing Survey.	Senior Marketing Officer .	Mr. L. K. Hardique, B.Sc. (Edin).	13th February 1935.	Promoted from the Department.	
	Assistant Marketing Officer	Mr. Narmad Kumar Das, L.Ag. (Hon.).	1st March 1935 .	Promoted from the Department.	
	Assistant Marketing Officer.	Mr. M. Ali, B. Sc., I. D. D..	...	...	
	Marketing Manager . .	Mr. A. Mubin Chowdhury, B.A.	...		
NORTH-WEST FRONTIER PROVINCE.					
1. Improvement of marketing in the North-West Frontier Province.	Assistant Marketing Officer	Mr. D. N. Saptra, M.A., F.R.E.S. (London.)	1st May 1935 .	Recruited by the late Director of Agriculture.	
2. (Veterinary) Scheme for investigation of disease.	Disease Investigation Officer	Mr. S. R. Chadda, B.Sc., M.R.C.V.S.	7th July 1935 .	Direct appointment.	
3. San Jose Scale Survey Scheme	Senior Entomologist .	Dr. Nazir Ahmad, M.Sc., (Zoology) D.I.C. (London.)	2nd December 1937.	Through the Federal Public Service Commission.	
4. Horticultural Scheme, N. W. F. P.	Horticulturist . . .	R. Zarbakht Khan, B.Sc., (Edin.)	21st October 1938.	Through the Imperial Council of Agricultural Research.	
ORISSA.					
1. Rice Research Scheme . .	Paddy Specialist . .	Mr. P. D. Dixit, M.Sc. (Lucknow).	9th January 1938.	Promoted from the post of the First Research Assistant and appointed through the Public Service Commission (India).	
	First Research Assistant .	Sri P. Uttaman, B.Sc., Ag., M.Sc. (Madras).	28th May 1939 .	Appointed through the Public Service Commission (India).	
	Physiological Assistant .	Sri G. Venkatachalam, M.Sc. (Benares Hindu University).	21st September 1938.	Promoted from the post of Research Assistant and appointed by the Director of Development.	

	Research Assistant . .	Sri T. N. Sivapuri, M.Sc. (Lucknow).	31st July 1937 .	Appointed by the Director of Development and approved by the I. C. A. R.
	»	Sri H. Misra, B.Ag. (Nagpur)	19th September 1938.	Promoted from the post of fieldman Overseer and appointed by the Director of Development and approved by the I. C. A. R.
	Fieldman Overseer . .	Sri Artatran Barik . .	27th June 1937 .	Appointed by the Director of Development and approved by the I. C. A. R.
		Sri Nandagiri Venkata Rao, B.Ag.	4th August 1937.	
		Sri Pravat Kumar Mukherji (Matric).	29th July 1937 .	
		Sri N. A. Parsuram, B.Sc., Ag.	10th January 1939	
		Sri A.V.Pichumani, B.Sc., Ag.	2nd May 1939 .	
2. Marketing Scheme . .	Senior Marketing Officer .	Mr. K. Gopalan, M.A., Dip. Econ., C.H.D., B. Com. (Manchr.).	12th July 1939 .	Appointed by the Provincial Government.
	Junior Marketing Officer .	Sri Madan Mohan Pradhan.	16th September 1937.	
		Sri Radhanath Dwivedi, M.A.	26th July 1939 .	
3. Sugarcane Insect Pest Scheme	Entomological Assistant .	Mr. P. Israel, M.A. . .	20th September 1939.	Appointed by the Director of Development.
	Fieldman . . .	Sri T. S. Sundaram, B.A. .	27th March 1939 .	
4. Fruit Research Scheme .	Horticulturist . . .	Dr. D. N. Srivastav, B.Sc. Ag., Ph.D. (Lond.).	14th November 1939.	Appointed by the Public Service Commission (India).
	Senior Assistant . .	Sri Haricharan Das Paul, B.Sc. Ag.	21st December 1939.	Appointed through the Joint Public Service Commission (Bihar, Orissa, C. P. and Berar).
5. Investigation of Animal Diseases in Orissa.	Veterinary Investigation Officer.	Mr. P. S. Kuppuswami, G.M.V.C.	28th April 1938.	Appointed by the Provincial Government through the Public Service Commission (India). Holds lien on a permanent appointment in the Veterinary Department of Madras.
SIND.				
Scheme for Improvement of Marketing, Sind.	Marketing Officer, Livestock Group.	Dr. L. M. Hira, G. B. V. C. A., A. R. San, I. (London).	1st September 1935.	Recruited through Public Service Commission.
	Marketing Officer, Cereal Crops Group.	Mr. D. K. Makhijani, B.Ag. .	13th September 1939.	Appointed by Provincial Government.
	Marketing Officer, Special Crops Group.	Mr. R. N. Gidwani, B.Ag. .	2nd September 1939.	

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
HYDERABAD STATE.					
1. Dry Farming Research Scheme.	Superintendent	Mr. Shameem Zuhrie, B.Sc., C.D.A. (Glas.).	29th August 1936	Promoted from the Department.	
	Senior Assistant	Mr. D. V. G. Krishnamoorthy, B. Sc., B. Ag.	8th July 1939		
2. Castor Research Scheme	Technical Assistant	Dr. L. G. Kulkarni, Ph. D.	10th September 1935.	Fresh appointment.	
	Assistant	Mr. N. G. Masur, B.Ag.	10th October 1935	Services obtained from the Bombay Government.	
MYSORE STATE.					
1. Scheme for the improvement of the quality of Indian coffee.	Assistant Chemist	Mr. N. G. Chokkanna, M.Sc., Ph.D.	1st March 1939	Appointed by State Government.	
2. Sugarcane Research Scheme (Breeding of Thick Canes).	1. Senior Assistant Botanist	Mr. B. Venkoba Rao, B.Sc.	14th April 1937	By promotion in the Department.	
	2. Junior Assistant Botanist	Mr. M. L. Subbanna, B.Sc. (Hons.).	1st February 1933	Appointment by State Government.	
	3. Statistician	Mr. A. Anantha Padmanabha Rao, B.A., F.R. Met. Soc.	1st February 1939	By promotion.	
	4. Assistant Chemist	Mr. K. Lakshmi Narayana Bhatta, B.Sc.	1st February 1939	Appointed by State Government.	
3. Investigation of Johne's Disease Research Scheme.	Veterinary Inspector	Mr. S. Srinivasamurthy, B.Sc., L.V.P.	21st January 1935	Fresh appointment.	
4. Fruit Research Scheme	Manager, Fruit Research, Station.	Mr. N. S. Iyengar	...	.....	
5. Sugarcane Borer Work.	Assistant Entomologist	Mr. H. A. Abdur Rub, B.Sc..	8th February 1939	By promotion.	
BARODA STATE.					
Investigation of suitable types of canes in Gujarat.	Sugarcane Chemist	Mr. Kusumayudh Chunilal Desai, B.Ag.	16th November 1936.	Recruited through the State Service Committee.	

TRAVANCORE.				
Scheme for the investigation of the root and leaf diseases of cocoanut palms.	Plant Pathologist . .	Dr. K. P. V. Menon, B.Sc., D.I.C., Ph. D. (London).	8th March 1937 .	Direct appointment.
	Assistants to the Plant Pathologist.	Mr. U. Karunakaran Nair, B.A., B.Ag.	26th March 1937	Promoted from the Department.
		Mr. V. Sadasivan, B. Sc.,	26th July 1939.	Direct appointment.
AGRA UNIVERSITY.				
Investigation on "Cereal Rusts".	Mycologist Assistant .	Mr. Raghubir Prasad Gupta, M.Sc. (Agra). Botany with special paper on parasitic Basidiomycetes. (including rusts).	11th April 1930 .	Direct appointment.
	Senior Research Assistant	Mr. H. L. Gulatia, B.Sc., (Punjab); M.Sc., (Hons. Sch.) (Punjab)—Botany.	1st November 1931	Direct appointment.
	Research Assistants . .	Dr. B. M. Johri, M.Sc., (Agra); D.Sc. (Agra).	1st September 1937	Direct appointment.
		Mr. J. L. Merh, M.Sc. (Allahabad).	10th May 1935 .	Direct appointment.
	Junior Research Assistants	Mr. Ram Piyara Mal, B.Sc. (Ag.) (Punjab).	1st April 1933 .	Direct appointment.
		Mr. T. B. Lal, B.Sc., (Ag.) (Allahabad) Assoc. I.A.R.I.	7th February 1938	Direct appointment.
	Meteorological Assistant .	Mr. Gulab Chand Goyal, M.Sc. (Agra).	15th July 1935 .	Direct appointment.
	Personal Research Assistant to Officer-in-Charge.	Mr. D. D. Gupta, B.Sc., Hons. Agric. (Wales).	16th December 1937.	Direct appointment.
	Lecturer in Botany . .	Dr. R. P. Asthana, M.Sc. (Allahabad); Ph.D. (London); D.I.C. (London).	10th July 1936 . .	Direct appointment.
	Morphological Assistant .	Mr. H. R. Bhargava, M.Sc. (Agra)—Botany.	28th July 1937 .	Direct appointment.
	Assistant for Survey (Punjab).	Mr. Kartar Singh Grewal, M.Sc. (Punjab).	30th January 1939	Direct appointment.
	Assistant for Survey (Madras).	Mr. T. V. Pattabhiraman, B.Sc. (Ag.) (Madras).	10th October 1935	Direct appointment.

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
UNIVERSITY OF MADRAS.					
Scheme of Research on Morphology and Anatomy of Sugarcane Sorghum Hybrids.	Assistant . . .	Mr. K. R. Ramanathan, M.Sc.	(Up to November 1938).	...	The work is carried on under the supervision and guidance of Dr. T. Ekambaram.
		Miss V. K. Kamalam, B.Sc. (Hons.).	January 1939 .	Direct appointment.	
BENARES HINDU UNIVERSITY.					
Scheme of Research on the Physiology of cane and wheat.	Physiologist incharge of the scheme.	Professor B. N. Singh, D.Sc.	...	...	Director of the Scheme.
	Assistant to relieve Professor B. N. Singh of part of his university work.	Mr. K. Kumar, M.Sc. . .	1st June 1937 .	Appointed by the Council, Benares Hindu University, *vide* resolution No. 74 (*a*), 25th July 1937.	
	Senior Research Assistant	Dr. K. N. Lal, D.Sc. . .	1st June 1937 .	Appointed by the Council, Benares Hindu University, *vide* resolution No. 69 (*a*), 24th July 1937.	
	Junior Research Assistant	Mr. S. N. Singh, M.Sc. (Agric. Bot.).	1st June 1937 .	Appointed by the Council, Benares Hindu University, *vide* resolution No. 69 (*b*), 24th July 1937.	
	Laboratory Assistant .	Mr. P. V. V. Seshagiri, M.Sc. (Agric. Bot.).	1st June 1937 .	Appointed by the Council, Benares Hindu University, *vide* resolution No. 69 (*c*), 24th July 1937.	
LUCKNOW UNIVERSITY.					
Helminthiasis Scheme . .	Research Assistant . .	Dr. Bipin Bihari Sinha, D.Sc.	February 1937 .	Direct recruitment from the University of Lucknow.	The candidate was already at the University and was well qualified for the post.

ALLAHABAD UNIVERSITY.					
Nitrogen loss from Soils and nitrogen fixation in Soils.	(1) Chemical Assistant .	N. N. Biswas, M.Sc. . .	1st August 1936 .	Appointed by the Imperial Council of Agricultural Research on the recommendation of Professor N. R. Dhar.	
	(2) Bacteriological Assistant.	E. V. Seshacharyulu, M.Sc. .	1st August 1936 .		
INDIAN INSTITUTE OF SCIENCE, BANGALORE.					
1. Extension of work on "Quality" of Crops.	Assistant Biochemist .	Dr. A. Sreenivasan, M.A., D.Sc., D.I.C.	...		
2. Investigation for preparation of cheap synthetic manure from town refuse and waste materials.	Assistant Biochemist .	Dr. C. N. Acharya, M.Sc., Ph. D., A. I. C.	...		
ALLAHABAD AGRICULTURAL INSTITUTE.					
A Scheme for research on the composition of milk.	Assistants . . .	Ishwar Das Dharni, B.Sc. (Hons.) M.Sc.	1st July 1936 .	Transferred from position as Teacher of Chemistry at Ewing Christian College.	Reverted on 30th June 1938.
		B. F. Agarwal, B.Sc. (Agr.) .	1st July 1936 .	Appointed direct, being available as he had just completed his B.Sc. (Agr.).	
GOKHALE INSTITUTE OF POLITICS AND ECONOMICS, POONA.		S. R. Roy, B.Sc. (Agr.) .	1st July 1938 .	Appointed direct.	
Scheme for Research in Agricultural Economics.	Director, Gokhale Institute of Politics and Economics.	D. R. Gadgil, M.A., M.Litt. (Cantab.).	1930 . . .		
	Senior Investigator. . .	V. R. Gadgil, B.Ag. (Bom.), M.Sc. (Calif.).	1931 . ..		
CALCUTTA UNIVERSITY.					
1. Investigation of the Life History. Bionomics and Development of Fresh Water fishes of Bengal.	Research Assistants . .	Mr. Matiranjan Dasgupta, M.Sc.	1st December 1936	Appointed by the Syndicate, Calcutta University.	
		Mr. Benoyendranath Dasgupta, M.Sc. (appointed in place of Mr. Motiranjan Dasgupta, M.Sc. resigned on 30th June 1938).	1st July 1938 .		
		Mr. Santosh Ranjan Mazudar, M.Sc.	1st September 1937.		

Name of Scheme.	Name of post.	Name of officer and qualifications.	Date of appointment.	How appointed, promoted from the Department or recruited through Public Service Commission, etc.	Remarks.
CALCUTTA UNIVERSITY—*contd.*					
2. Properties of Colloid Soil Constituents (Extended Scheme).	Senior Assistant Soil Chemist.	Dr. R. P. Mitra, D.Sc. (Cal).	1st November 1938.	Direct Appointment	First appointed on 1st February 1933 under the old scheme.
	Assistant Soil Chemist	Mr. B. Chatterjee, M.Sc. (Cal).	1st November 1938.	Direct Appointment.	First appointed on 1st December 1937 under the old scheme.
	Assistant Soil Chemist	Mr. S. K. Nandi, M.Sc. (Cal.).	1st September 1939.	Direct Appointment.	
	Assistant Physical Chemist	Mr. S. N. Bagchi, M.Sc. (Cal.)	1st June 1939	Direct Appointment	
3. Research into Problems relating to Coastal Soils.	Assistant Soil Chemist	Mr. S. K. Mukherjee, M.Sc. (Cal.).	1st September 1939.	Direct Appointement	First appointed on 1st November 1938 under the scheme of research into the properties of colloid soils constituents.
	Assistant Soil Chemist	Mr. N. P. Datta, M.Sc. (Cal.).	1st September 1939.	Direct Appointment.	
	Field Assistant	Mr. U. R. Samaddar	1st February 1940	Direct Appointment.	
4. Statistical Studies and Training of Agricultural Officers in Statistics.	Statistician	Mr. R. C. Bose, M.A. (Delhi) and (Cal.).	June 1935	Appointed through Federal Public Service Commission in June 1935.	Resigned with effect from 15th January 1940.
	Statistician	Mr. S. N. Roy, M.Sc. (Cal.).	4th November 1938	Officiating with effect from 4th November 1938 in the vacancy caused by the death of S.S. Bose. Appointed permanently through Federal Public Service Commission with effect from the 2nd January 1940.	
	Assistant Statistician	Mr. K. Raghavan Nair, M.A. & M.Sc. (Mad.).	1st July 1939	Appointed by the Syndicate, Calcutta University.	Officiating from 15th January 1940 in the post of Statistician (vacancy caused by the resignation of R. C. Bose) having obtained the second nomination for the post.

	Assistant Statistician .	Mr. Sadasiv Sengupta, M.Sc. (Dacca), B.Sc. (London).	15th January 1940	Officiating appointment sanctioned by the I. C. A. R. on the recommendation of the Syndicate, Calcutta University.
	C			
	Computer . . .	Mr. Sudhirkumar Banerjee .	July 1931 . .	Appointed by the Syndicate, Calcutta University.
	Computer . . .	Mr. Jitendramohan Sengupta	July 1939 . .	
	Steno-typist . .	Mr. Nareshchandra Mukerjee	February 1938 .	
	Computer . . .	Mr. Jaladhar Sarma . .	July 1931 . .	
	Computer . . .	Mr. Subodhchandra Dasgupta	February 1935 .	
	Computer . . .	Mr. Herambochandra Ghosal	July 1939 . .	
DACCA UNIVERSITY.				
1. Dacca University Scheme of research on the Lateritic Soils of India and on the nutrition of rice plant.	Senior Assistant (Biochemist).	Dr. P. K. De., M.Sc. (Dac.), A.I.I.Sc., Ph.D. (Lond.).	11th August 1930 (till 19th November 1939).	Appointed through a selection Board.
	Research Assistant .	Mr. M. Sulaiman, M.Sc. (Dac.)	20th November 1939.	Appointed by the Executive Council, Dacca University with the approval of I. C. A. R.
	Assistant in Soil Chemistry	Dr. J. N. Chakravarty, M.Sc. (Dac.) Assoc., I.A.R.I., Ph.D. (Dac.).	11th August 1930.	Appointed through a selection Board.
	Typist Assistant . .	Mr. Muhammad Hatem Ali, B.Sc.	11th November 1935 (till 3rd September 1939)	Appointed through a selection Board.
	Typist Assistant . .	Mr. M. K. Mukherjee, M.Sc. (Dac.).	4th September 1939.	Appointed by the Executive Council, Dacca University.
2. Scheme for investigation an Organic constituents of Indian Soils.	Research Assistant .	Mr. Haridas Bhowmik, M.Sc. (Dac.).	5th January 1939	
	Research Assistant . .	Mr. Jyotirindra Mohan Sen, M.Sc. (Dac.).	5th January 1939	

APPENDIX X.

Rice Committee, Third Meeting, November, 1939.

Brief Subject.	*Recommendations.*
1. *Progress Report on Rice Research Schemes, 1938-39* :—	Approved subject to certain observations.
(*a*) Bengal.	
(*b*) United Provinces.	
(*c*) Assam.	
2. *Technical programme of work under extension and new schemes of research* :—	Approved subject to certain observations.
(*a*) Central Provinces and Berar.	
(*b*) United Provinces.	
(*c*) Baroda.	
(*d*) Travancore.	
(*e*) Kashmir.	
3. *Extension Schemes* :—	Proposals were approved on the basis of the new policy of rice research enunciated for guidance with effect from 1939-40 ; the programme being limited and council paying senior reasearch staff.
(*a*) Bengal, beyond 31st March 1940.	
(*b*) Bihar, beyond 31st March 1940.	
(*c*) Assam, beyond 31st March 1940.	
(*d*) Orissa, beyond 20th January 1940.	Extension recommended on 50 : 50 basis.
4. *New Schemes.*	
(*a*) Punjab scheme for investigating problems of quality in fine rices in the Punjab.	The Committee recommended the scheme for sanction. It also recommended that the quality of talc as a preservative may be tested in connection with this scheme for investigating the problems of quality in fine rices in the Punjab.
(*b*) Note by the Rice Specialist, Sabour on investigations of the factors which govern quality in fine rices and the possibility of growing such rices in tracts other than those to which they originally belong without any deterioration in their quality.	The note was recorded.
(*c*) Scheme from the Government of Madras for a study of the Rice-growing conditions and the botanical and chemical work on rice in more advanced countries.	The consideration of the scheme was postponed due to war conditions.
(*d*) Sind scheme on manurial and agronomic work and water requirements of rice in Sind.	The scheme with suitable reduction in the programme and the financial liability of the Council was recommended. The question as to what amount of travelling allowance for the staff if any should be provided was left to be discussed along with the general question by the Advisory Board.

Brief Subject.	*Recommendations.*
OTHER ITEMS.	
5. Further consideration of Sir John Russell's recommendation regarding diseases of rice.	In order to get coordinated research started at the Centre to investigate the important diseases of rice, *e.g.*, Ufra, Leaf Spot, Foot-Rot, the Director, Imperial Agricultural Research Institute should be approached with the suggestion that Dr. Padwick should take up the matter with the provinces with a view to put up a suitable scheme to the Advisory Board.
6. Use of talc for polishing and preserving purposes in the rice industry.	It was considered inadvisable to take up the study of talc as a polishing agent; but was recommended that its quality as a preservative may be tested in connection with the Punjab scheme for investigating the problems of qulity in fine rices in the Punjab.
7. Question of placing the Standing Rice Committee on a permanent basis on the lines of the Indian Central Cotton Committee.	The Rice Committee should meet more often and should devote more attention to rice development and rice marketing and if this Committee was not in a position to do so on account of technical or financial difficulties, steps should be taken to establish instead a statutory committee on the lines of Indian Central Cotton Committee.
8. Grading of Rice.	The Agricultural Marketing Adviser should consult the trade interests concerned at Calcutta before making recommendations for the grading of *Patnai* rice.
9. Removal of Stones (Kankar) and other foreign substances from Paddy.	It was primarily a local problem and that the attention of the Provincial Government should be drawn to it with the Rice Committee's suggestion that propaganda should be undertaken among the cultivators to instruct them to avoid letting *Kankar* get into the paddy and to attend to winnowing properly.
10. Commercial rice and its qualities.	It was not considered feasible to take into consideration the nutritive value of rice for classifying it for commercial purpose. The question as to whether any other rice of type similar to Seets (Patnai) rice can be grown in Bengal may be referred to the Provincial Department of Agriculture.
11. Reduction of Railway freight on paddy in relation to rice.	The Marketing Staff should explore the possibility of recommending the introduction of reduced rates of freight for paddy, particularly in areas where no mills exist, and that in arranging the special rates the interests of local cottage industries should be taken into account.
12. The trade position and recent price-trends of rice	Recorded.

Brief Subject.	*Recommendations.*
OTHER ITEMS—*contd.*	
13. Economic disadvantages of Aman peddy lands.	A copy of the note should be sent to the Bengal Government for taking such action as they think fit, with the Rice Committee's suggestion that they might explore the possibility of increasing the yield per acre on an economic basis by a suitable system of irrigation.
14. * *	* *
15. The part played by different major factors in increasing the yield per acre of paddy and the extent to which such increased production could be expected, on economically sound lines, under Indian conditions. (Bihar).	To increase the outturn of rice the 'project' system should be tried to popularise the improved Agricultural practices and other improvements and suitable schemes may be prepared for the purpose. As to the form these schemes should take, that would be decided after the meeting of the Advisory Board in the light of the discussions that would take place.
16. Description of crop plant characters and their ranges of variation-variability of rice by K. Ramiah and others. The need for modifications.	There was no need to alter the schedule on which plant breeders were already working.
17. Need for systematic work on the pretreatment of seeds. *and* Research work on the production of mutants detailed studies on vernalisation, electro-culture, etc.	The matter might wait for the present so far as venalisation was to be discussed at the meeting of the Crops and Soils Wing, of the Board of Agriculture and Animal Husbandry in India, December 1939.
18. Note received from the Government of of Sind regarding the fine Pulao Rices.	The note was recorded.
19. Standardisation of hulling tests.	The Committee agreed that for the purpose of comparison of various rices throughout India it was desirable to adhere to the recommendation contained in the schedule already in use for describing the rice varieties. This however should not interfere with any experiments in the comparison of Apparatuses for carrying out hulling tests.
20. Evolving some suitable cooking apparatus for carrying out cooking experiments.	Noted.
21. Some problems in rice in the North Konkan—Note by Mr. G. D. Vartak.	It was suggested that if the Bombay Government desired they should put a scheme on Salt rice which would be considered on its merits.
22. Devising some apparatus to facilitate the process of emasculation and hybridisation in paddy (Orissa).	Noted.
23. Research on growing deep water paddy in Bihar and East United Provinces.	It was considered that the Bihar Agricultural Department should take up the matter with the United Provinces Agricultural Department and come to some agreed plan before approaching the Rice Committee.

APPENDIX XI.

Statement showing the recommendations made at the third meeting of the Wheat Committee, May 1939.

(SECTION A).

Subject.	*Recommendations.*
1. Position in regard to wheat research.	More research work should be undertaken on breeding rust-resistant varieties of wheat.
2. The desirability of the Provincial Governments looking into the matter of the actual areas under pure varieties.	Provincial Government might be requested to record sepatately as far as possible the actual areas under pure varieties.
3. Suggestion by the Agricultural Marketing Adviser that Agricultural Departments should not attempt to extend the cultivation of ordinary wheats in typical *durum* districts.	This should not be attempted.
4. Research on crop mixtures to provide the cultivator with a better alternative than barley for sowing with wheat, particularly on barani lands.	Mixed sowing of barley and wheat should be discouraged as barley cannot be easily separated from wheat at the time of harvest—some other crop should be selected for such sowing.
5. Construction of cement *khattis* for wheat storage, and for storage on a small scale.	For bulk storage cement *khattis* were best but their construction should be left to private enterprise. For seed storage, research should be carried out to find out the best method of storage.
6. Hampering effect of octroi duties.	No octroi duty should be levied by local bodies on agricultural produce and if levied should be more or less at a uniform rate.
7. Devising an improved form of separating equipment for power driven *chakkis* grinding *durum* wheats, and screening apparatus to increase the types of products turned out by small mills.	This might be referred to the Industries Departments of Provincial Governments.
8. Elimination of excessive competition among roller mills.	The first step in this direction is to discourage the consumption of low quality wheat by standardisation of qualities. Steps should be taken to reduce the cost of distribution by lowering the transport charges.
9. The labelling of goods with a quality description and the daily selling price.	This should be encouraged.

(SECTION B).

1. Position in regard to wheat production in India.	In view of the facts that the area under wheat had decreased considerably and that the import duty had been re-imposed less than six months ago, no question of restriction of exports or of area need be considered at present but the position should be carefully watched.
2. Recommendations of the second meeting of the Wheat Committee.	Noted.

Subject.	*Recommendations.*
3. The improvement of statistics of wheat production.	No action, pending the proposed enquiry of a similar nature in the case of sugarcane.
4. Introduction of improved varieties of wheat from the point of view of milling and the improvement of white flour percentage in wheat.	It is not necessary to introduce at present any special varieties for milling purposes but certain special varieties should be graded under the Agricultural Produce (Grading and Marketing) Act, 1937.
5. Determination of natural moisture content of wheat.	This may be considered in connection with the question of standard contracts.
6. Information regarding quality of wheat available in different areas.	A map showing the varieties of wheat and the main localities in which they are grown should be prepared every year for the use of the trade mentioning also the protein content of the different varieties, by the Cereal Institute when established.
7. Establishment of closer connection between markets.	This is linked up with the question of standardisation of weights and the general acceptance of standard contracts which are separately receiving attention.
8. The formation of an association to establish a *durum* wheat contract in Central and Southern India.	No action as an Association has recently been formed at Warrangal.
9. Effect of new contract at Amritsar on the quality of wheat marketed locally.	Satisfaction was expressed at the progress made.
10. Fixation of merchandising charges: their number and amounts. Accounting for the cost of bags in quotation for the produce.	No action as this is covered by the Agricultural Produce Marketing Bills in various provinces.
11. Formation of All India Federation of Grain and Oilseeds Association.	The question of forming such an Association, which was under active consideration, was commended.
12. Possibility of enlarging the sphere for the breed-casting of wheat prices.	No further action required at present.
13. Washing of wheat prior to grinding by *chakkis*.	No opinion could be expressed without making further experiments.
14. Statistics relating to the milling of wheat and wheat products.	The advisability of supplying a statement showing the total quantity of different products turned out by mills should be impressed on mills.
15. Standardisation of milled products from cereals.	*Maida* and other wheat products should be included in the schedule to the Agricultural Produce (Grading and Marketing) Act, 1937.
16. The use of wheat flour by the textitle industry in sizing mixtures.	As the increasing imports of sago flour affecting the consumption of wheat flour by the textile industry in sizing mixtures, the Government of India should be requested to consider the question of imposing a tariff on 'sago' flour by classifying it under 'Starches and Farina'.
17. The development of indigenous cereal product industry and improvement of containers for cereal products.	No action as this is receiving attention already.

APPENDIX XII.

Recommendations of the Tobacco Sub-Committee on the Report on the Tobacco Marketing Survey in India and Burma.

Subject.	*Recommendations.*
1. Preparation of reliable statistics of tobacco production. (Report pages 71-72 and 384).	In view of the fact that the different varieties of tobacco are rarely grown in the same area, the Government of India may be requested to move Provincial Governments to collect annually, area and production statistics of tobacco as classified below, as an experimental measure to see what practical difficulties if any, are encountered :— 1. Nicotiana Rustica. 2. Nicotiana tobacum :— (*i*) Virginia type cigarette leaf. (*ii*) Deshi (Natu) cigarette leaf. (*iii*) Other types of tobacco such as those used for beedis, hookah, chewing and snuff.
2. Steps to be taken to control the quality of exports of unmanufactured cigarette tobacco (flue cured and sun-cured) on the basis of standard grades the absence of which has done great harm to trade in Indian tobacco abroad. (Report pages 375-377).	The Tobacco Sub-Committee recommended unanimously that :— (1) Grading must be done before exports are permitted as the exports of ungraded tobacco led to difficulties in marketing and the trade as a whole suffered thereby. (2) As the only effective method of securing the necessary grading is by legislation the Central Government be requested to enact the necessary legislative measures for the purpose at an early date ; (3) The nature of the statutory grades to be fixed should be determined by the Agricultural Marketing Adviser after further consultation with the various interests concerned. (4) Provision should be inserted in the proposed legislation empowering the Government to control, when necessary, the exports of certain prescribed low grades of tobacco.
3. The desirability of re-adjusting the freight rates on unmanufactured tobacco, cigarettes and *beedis* with a view to making the freight charges on the unmanufactured product relatively less than at present. (Report pages 299-300).	The Imperial Council of Agricultural Research should approach the Railway Board for the purpose.
4. The steps to be taken for the further expansion of the industrial manufacture of tobacco products.	Information should be obtained as to what scope there is for the manufacture of nicotine, before any definite recommendation can be made.

Subject.	*Recommendations.*
5. The desirability of more consultation among manufacturers with a view to regulating the distribution of their products on a sound basis.	In view of the doubts as to the feasibility of an Association of manufacturers in India, it has been suggested that there should at least be occasional conferences of manufacturers with a view to deal with common problems such as regulating the distribution of their products on a sound basis.
6. The steps necessary to put a stop to the grosser forms of adulteration. 7. The feasibility of standardising the better qualities of manufactured tobacco. 8. The prevention of misuse of trade marks.	These matters might be considered by the Association of manufacturers, if formed or the Conference of manufacturers referred to in item 5 above.
9. Artificial fertilisers and the question of legislation.	It was explained that the question of Central legislation for the prevention of adulteration of fertilisers is separately under consideration. The Board recommended that such legislation should be introduced at an early date.
10. The steps to be taken for the improvement of the outturn and quality of *hookah* tobacco. 11. The feasibility and advisability of growing in India the types of tobacco at present imported into India.	The general feeling was that very little had been done for the improvement of the outturn and quality of such tobacco and it was agreed that more research on this problem was called for. The Directors of Agriculture were requested to make a note of this recommendation and put up proposals in due course.
12. The steps to be taken to raise the general level of the quality of cigarette tobacco by organised direction and control and for this purpose to maintain pure seed, to organise the distribution of adequate supplies to growers and to educate growers in the production of the right quality of cigarette leaf in view of the fact that the purity of any variety of tobacco is subject to rapid deterioration. (Report page 376).	This is a matter which concerns the Governments of Madras and other provinces interested in the cultivation of cigarette tobacco. It was particularly recommended that the Madras Government should be invited to take the necessary steps.
13. The desirability or otherwise of inducing buyers to enter into contracts with growers at the time of planting in order to ensure a ready market for the growers' produce at harvest time. (Report page 381).	Buyers should be induced to enter into such contracts and adequate safeguards should be provided to ensure that the terms of the contract are fair to all concerned and are scrupulously observed. This might be on a voluntary basis to start with, legislation being introduced if considered necessary subsequently.
14. The desirability of adopting measures for the safeguarding of the tobacco industry by licensing the operators of flue-curing barns and re-drying plants and to control the type and quality of leaf handled by them on the lines of the Mysore Cigarette Tobacco Safeguarding Act. (Report page 377).	Provincial and State Governments should enact legislation for the licensing of barns and for the adoption of other measures of control in new areas where the cultivation of Virginia Tobacco may be introduced.

Subject.	*Recommendations.*
15. Consideration of the improvement of existing methods of flue-curing particularly in regard to fixing of colour of leaf, reducing the time taken in flue-curing and bringing down the cost of construction, fuel, etc. (Report page 377).	Provinces and States should take up trials in the flue-curing barns provided by the Imperial Council of Agricultural Research and they may send up their schemes, if any, in this connection, for consideration by the Council.
16. The steps to be taken to prevent the practice of mixing bad and good quality tobacco leaf and passing of low quality as high quality produce by the adoption of standard grades and methods of packing.	The grower should do the preliminary grading and should be encouraged in this. Necessary propaganda should be undertaken and the work should be on a voluntary basis at present.
17. The desirability of taking action on the lines of the Madras Commercial Crops Markets Act, in the concentrated areas of production of Bombay, Bengal and Bihar, with a view to organise the regulated markets and open auction floors for the sale of graded tobacco. (Report pages 378-379).	The Tobacco Committee recommended that the Agricultural Produce Marketing Acts should be passed wherever such legislation does not exist.
18. The feasibility of providing suitable and safe warehouse accommodation for high quality tobacco and institution of a regular system of price quotation on the basis of standard grades so as to remove the objection of banks and shroffs to advance loans against tobacco.	A system of price quotation on the basis of standard weights and grades should be arranged as far as practicable.

APPENDIX XIII.

Crop and Soils Wing of the Board of Agriculture and Animal Husbandry in India, third Meeting, December, 1939.

Brief subject.	*Recommendations.*
Soil Conservation	The following resolution was unanimously adopted :—

"This Board desires to re-emphasise the need for organisations to undertake the practical application of anti-erosion measures. It is suggested that for limited areas with local problems there should be anti-erosion Boards which would

(1) define the problems,

(2) devise measures for their solution, with due regard to any readjustment that may be necessitated thereby,

(3) undertake propaganda among the landowners and cultivators likely to be affected,

(4) be responsible for the immediate oversight of the carrying out of the measures proposed.

For such Boards to function it is essential that there should be powers to ensure that the minority shall cooperate when a majority of landowners and cultivators have agreed to the carrying out of anti-erosion measures.

For each Province or State it is suggested, that there should be a Provincial or State Anti-Erosion Committee (especially where a whole Province or State is affected by erosion) which contain members of all the Departments concerned, plus representatives from the anti-erosion Boards where these exist. There should also be non-official representatives of science and of the public. Such a Committee should devote itself particularly to Provincial or State aspects of (1) policy, (2) co-ordination, (3) expenditure, (4) research.

It is also suggested that there should be an All-India anti-erosion Committee. It should deal with (1) pooling of information, (2) encouragement of research, (3) publication, (4) the larger questions of (*a*) methods (*b*) survey (*c*) policy. This Committee should work in close liaison with and hold joint sessions with the Standing Soil Science Committee of the Imperial Council of Agricultural Research. It is likely that certain members will be common to both Committees. As the Central Board of Irrigation has been devoting much attention to anti-erosion problems, its collaboration should be invited.

	Brief subject.	*Recommendations.*
		This Board also recommends that India should take full advantage of the experience now accumulated in the United States of America regarding both the technical and administrative aspects of anti-erosion work. It suggests that (1) full use should be made of the publications of the Soil Conservation Service (2) arrangements should be made to send to America two anti-erosion workers from India, one representing the work done in non-agricultural land and the other representing work done in agricultural land, (3) one of the officers of the American Soil Conservation service should later on be invited to come to India to help with his advice ". During the course of the discussion it was made clear that the Boards contemplated would only be advisory and would not have any administrative functions or any responsibility for carrying out orders.
2	The problem of the physical basis of Soil structure and its relation to tillage and manuring.	The Board accepted Professor Mukherjee's suggestion that detailed observations on soil structure in all soil work should be recorded, where this is not already being done.
3	Vernalisation . . .	The Board observed that both fundamental and practical aspects of this subject required investigation and that as different parts of India stood in need of the application of the method it would be a matter of great advantage if systematic experiments were laid out in typical localities with suitable crops to obtain conclusive data. The work should be pushed forward on the lines discussed but it should not be taken up at all sorts of places by amateurs. The work should be carried on at a few approved centres and workers should get in touch with Mr. Bori Sen and Dr. Pal who had already worked out its technique.
4	A review of the work on agricultural economics in India and consideration of the application of results obtained from such investigations to future agricultural development.	The Board resolved that a chair of Agricultural Economics should be established in as many Universities as possible and Professors of Agricultural Economics appointed at all Agricultural Colleges and attached to each Director of Agriculture, with the necessary field staff who would carry out investigations under their guidance. The greater part of the time of those appointed should be devoted to research and this should be subsidized by Government and there should be greater liaison between the different workers.
5	Plant virus Diseases . .	The subject was merely discussed and no general recommendation was made.
6	Plant hormones and their application in horticulture and the planting industry.	The Board endorsed the suggestion of Professor Mukherjee supported by the Chairman, *viz.*, that Mr. Carpenter should follow up his present paper by publishing the results of his experiments.

Brief subject.	*Recommendations.*
7 A critical examination of the comparatively low yields per acre obtained from the major crops of India in comparision with other countries where similar crops are cultivated, with a view to determining whether a re-orientation of agricultural work in India is required.	The following resolution was adopted unanimously :— " In the opinion of this Board various factors are responsible for the low average yields recorded of the different crops grown in India. It recommends that steps should be taken— (1) to examine at intervals every few years and, where necessary, to rectify, the figures of standard yields on the basis of which the average yields of crops are calculated ; (2) to study more intensively the prevailing cultural methods adopted, for securing the maximum economic yields and to introduce such methods elsewhere as also to take steps to obtain the maximum yields possible for the different crops in different tracts and ascertain the factors responsible for the same and study their economics. (3) to provide cultivators by organised and unified effort with the necessary facilities to enable them to increase the yields of their crops ; (4) to study soil requirements more intensively, to ascertain the recuperative powers of the soil and to utilize to the best advantage the available manures ; (5) to ensure that the increased yields does not result in depressing the market but secures a larger net income to the cultivators ; (6) to study the wider economic aspects of crop production, to frame suitable cropping scheme for the whole of India for utilising the available land to the best advantage and to adjust such production to the consumption ; and (7) to provide adequate facilities for Agriculture Departments to enable them to carry out their work effectively ".
8 Control of Insect pests.	The following resolution was passed :— " This Board recommends to the Imperial Council of Agricultural Research and the Government of India that early and effective steps should be taken to prevent the entry of pests and diseases in India from abroad by land, sea and air ". It was also agreed that steps should be taken to improve the arrnagements for fumigation at the ports and to stop the transport of infested material from one part of the country to another. As to whether these steps should be taken at nurseries or at the frontiers of the provinces was a matter of detail. The other aspects which required attention were the possibility of biological control of insect pests, investigation of insecticidal properties of vegetable insecticides and cooperation between cultivators and Entomologists for the control of insect pests.

APPENDIX XIV.

ACTION TAKEN ON THE RECOMMENDATIONS OF THE SUGAR COMMITTEE.

Action taken on the recommendations of the Sugar Committee (Eleventh Meeting).

Serial No.	Brief subject.	Recommendation.	Decision of the Governing Body.	Action taken.
1	2	3	4	5
1	Meetings of the Sugar Committee.	That as far as possible the meetings of the Sugar Committee should be held by rotation in places where research schemes are in progress.	Not referred to the Governing Body.	Noted.
2	Summary of some practical results of sugarcane research in India.	Steps should be taken to translate the "Summary of some practical research in India" into Hindi and Urdu.	Ditto . .	Revised edition of the pamphlet in English is in press. Action regarding the publication of the Hindi and Urdu translations of the revised pamphlet will be taken as soon as it is received from the press.
3	Progress Reports for 1937-38 on sugarcane research schemes.	Approved with certain observations	Ditto . .	Remarks communicated to all concerned.
4	Publication of progress reports	That the Provincial Governments should be allowed to publish the information arising out of the work done in schemes financed by the I. C. A. R. and the proposal should be put before the Advisory Board to allow the publication of such material and make these reports saleable.	The following suggestions of the Advisory Board were approved by the Governing Body :— "The Directors of Agriculture might be authorised to utilise the material in progress reports of the Councils' schemes for their annual administration re-	Ditto.

			ports or other bulletins and pamphlets issued by them and that copies of the progress reports should be sent to technical workers and factories after they had been passed by the Advisory Board, making it clear that the results of the experiments were still incomplete, but they should not be made saleable publications. Abstracts should, however, be published from time to time, and the final reports on the schemes should be saleable publications."	
5	Contents of progress reports .	(*i*) Such general remarks about ratooning and harvesting as are contained at page 18 of the Punjab report should be circulated to other sugarcane stations and their opinion invited to ascertain how far the recorded conclusions agreed with their own.	Not referred to the Governing Body.	The remarks of the Sugar Committee were communicated to all concerned.
		(*ii*) The meteorological data, as given in the Bihar report, should be given in all such reports and after an interval of a few years the co-relation of meteorological factors with the growth of plants should be explained in detail.	Ditto . .	Ditto.
		(*iii*) In the summary attached to the reports where specific recommendations are made references should be given to the corresponding pages in the text and tables.	Ditto . .	Ditto.

Serial No.	Brief subject.	Recommendation.	Decision of the Governing Body.	Action taken.
1	2	3	4	5
6	Establishment of first class sugarcane research stations.	Some selected stations should be developed into first class research stations where all types of work would be done on sound lines and that other stations should concentrate on varietal work and only take up other work if competent staff and other facilities were available. The selected first class stations should also investigate the best cultural methods to be adopted by the ordinary cultivator.	The Governing Body approved in principle of the proposal to concentrate fundamental and comprehensive research on sugarcane at a few selected centres, the remaining stations being utilised for varietal trials only.	The Governments of the United Provinces and Bihar are considering a scheme for the development of Shahjahanpur as a first class station. Their proposals will be placed before the Sugar Committee when received.
7	Technical programmes of— (*i*) Scheme for research on diseases of sugarcane. (*ii*) Scheme for sugarcane work at Jorhat Experiment Station, Assam.	Approved with certain observations	Not referred to the Governing Body.	Remarks communicated to— (*i*) The Director, I. A. R. I. (*ii*) The D. A., Assam.
8	Extension of the sugarcane research scheme in Bombay-Deccan.	The scheme be extended for the period 6th June 1940 to 31st March 1942 at a cost of Rs. 82,700.	Approved by the Governing Body.	Sanction communicated to the Bombay Government.
9	Extension of the scheme for research on Morphology and Anatomy of sugarcane-sorghum hybrids by Dr. Ekambaram.	Extension NOT recommended	The recommendation of the Sugar Committee that the scheme be NOT extended was approved by the Governing Body.	After the meeting of the Governing Body, it was reported that the scheme had remained in abeyance for a few months. The V. C., therefore, accorded sanction to the extension of the scheme, under Bye-

				law 7 of the Council, to the extension of the scheme for the corresponding period up to August 1940 for writing up the report and completing the work.
10	Scheme for the establishment of a sugarcane seedling testing sub-station at Cuttack, Orissa.	Consideration was postponed as a revised scheme in which the contribution to be made by the Provincial Government would be specified, would be submitted by the Orissa Government.	Not referred to the Governing Body.	The Orissa Government were informed of the Sugar Committee's decision and requested to submit the revised scheme, which has not yet been received.
11	Scheme for the survey of the yield and *gur* : cane ratio of sugarcane in the United Provinces and for the investigation of crop sampling technique.	(*i*) The I. C. A. R. should write to the United Provinces Government suggesting that in addition to the records of the total acreage under sugarcane, the irrigated area and the area under plant and ratoon canes, as well as the data in regard to areas under different varieties might, if possible, be recorded, as that would be useful from agricultural point of view. (*ii*) A revised scheme submitted by the D. A., U. P., was recommended. The scheme should be worked conjointly with the wheat sampling scheme sanctioned by U. P. Government.	The recommendations of the Sugar Committee were approved.	When the sanction was communicated to the United Provinces Government, they were unable to finance their wheat sampling scheme and it was decided that the sugarcane scheme may also be postponed. In March 1940, the United Provinces Government intimated that on reconsideration they had decided to finance the wheat scheme and requested sanction for the starting of the sugarcane scheme from the 1st April 1940. This has been accorded.
12	Scheme for the survey of the area and yield of sugarcane in Assam.	Consideration of the scheme was postponed till after the results of the investigations recommended in the U. P. were known.	Not referred to the Governing Body.	The decision of the Sugar Committee was communicated to the Assam Government.

Serial No.	Brief subject.	Recommendation.	Decision of the Governing Body.	Action taken.
1	2	3	4	5
13	Provision for the post of a Statistical Assistant at the Sugarcane Research Station, Pusa, up to the 17th March 1940.	The proposal was recommended with the proviso that the entertainment of a Statistician was not to be regarded as precedent by other stations.	Approved by the Governing Body.	The post was continued as recommended by the Sugar Committee. The Bihar Government have applied for further continuance of the post up to 17th March 1942. The proposals have been submitted for consideration by the Committee.
14	Application of Mr. K. L. Khanna, Sugarcane Specialist, Bihar Sugarcane Research Scheme, for deputation to Rothamsted for a period of 2 years.	The application was recommended .	The recommendation was accepted. It was, however, decided that Mr. Khanna should before proceeding abroad enter into a contract with the Council that on return from study abroad he would serve the Council for such limited period as the Council might require, and that he would not be entitled during his service under it to a scale of pay higher than he was drawing before he went.	The terms are being settled in onnsultation with the Bihar Government.
15	Scheme for research in the manufacture of sugar candy. (Cost Rs. 18,561 spread over 3 years).	Recommended	Approved . . .	Mr. Lalchand Hirachand offered to make a contribution of Rs. 10,000 for carrying on research on the subject at his factory at Revalgaon. The offer has been accepted

				and work will be carried on at two centres. Technical programme of the scheme is being submitted to the Committee for approval.
16	Submission by the Provincial Governments of figures showing the (*i*) average yield of sugarcane per acre and (*ii*) average *gur* ; cane ratio.	The I. C. A. R. should again address the Provincial Governments and Indian States concerned to continue the arrangements for another year and to extend and improve the methods they were now using.	....	The Provincial Governments and the Indian States concerned were addressed as recommended but the response has not been satisfactory. The question has again been submitted for consideration by the Sugar Committee.
17	Report on the *gur* making outfits in India.	The Report was approved and it was agreed that when published it should be circulated to all members.	....	The Report has been circulated.
18	Note by Mr. P. V. Issac entitled "The mid-rib as a factor in resistance to the sugarcane top-borer."	The fact might be brought to the notice of sugarcane breeders ; but more work was necessary to determine the extent of hardness and the influence of other factors.	....	The Note has been circulated to all Provincial Governments, Directors of Agriculture and Research Stations.
19	Note on the discontinuance of the sending of crossed sugarcane fluff to Shahjahanpur by the Imperial Sugarcane Expert.	The existing practice should continue and if there were demands from other stations and the Coimbatore staff were unable to cope with it, proposals for extra staff might be submitted to the authorities concerned.	....	The Director, Imperial Agricultural Research Institute, has been informed accordingly.
20	Use of molasses and press mud as manure.	In view of the large number of experimental tests that have been made during the last few years with molasses and press mud as manure in different areas, it is desirable to review the position.	....	The Director, Imperial Agricultural Research Institute has reviewed the position and a note on the subject is being submitted to the Sugar Committee.

Serial No.	Brief subject.	Recommendation.	Decision of the Governing Body.	Action taken.
1	2	3	4	5
21	Data regarding biological control of insect pests.	The note should be revised and then submitted to the Governing Body.	The revised note was submitted. The Governing Body decided that the note should be amplified after collecting data from Provinces and States concerned.	A further note was circulated in December 1939. Another note has been submitted for consideration by the Sugar Committee.
22	Note by the A. C. on Co-ordination in sugarcane manurial experiments.	Approved	....	No action was called for.
23	All-India Licensing of sugar factories.	The question be referred to the proposed All-India Sugar Conference.	....	The question of holding the proposed All-India Sugar Conference has been postponed for present.
24	Recommendations of the Tariff Board.	That action on the recommendations of the Tariff Board to be appointed in 1940 should be taken by the Government of India in October instead of March or April.	Approved *generally* . .	The Government of India have not accepted the recommendation. A copy of their decision is being placed before the Sugar Committee.
	1. There should be more research work on the agricultural side, particularly on insect pests and diseases and for the improvement of sucrose content (pages 67, 138 142 and summary 36 and 38).	1. There should be more research work on the agricultural side, particularly on insect pests and diseases, for improvement of sucrose content, resistance to frost, removing pithiness and ascertaining the fibre content of the crop. Whenever possible, these investigation should also	1. Approved generally .	1. To be placed before the All-India Sugar Conference.

	be carried out on private farms where owners of such farms are agreeable.		
2. Continuous trials of new varieties are essential and for this purpose (*a*) the number of testing stations should be increased and (*b*) an improved system of trials in experimental plots both in cultivators' fields and in factory farms should be devised (pages 137, 141; and summary 37).	2. Agreed to. This may be done generally on the lines followed in the Province of Bihar, as explained by the Director of Agriculture, Bihar.	2. Ditto . .	2. This is covered by the proposal to have a few first class sugarcane research stations, which is being submitted to the Sugar Committee.
3. The production of cane must be regulated (pages 41 and 46) so as to prevent over-production in one year and under-production in the next (page 31).	3. The Committee resolved that an All-India Conference be held as recommended by the Tariff Board and the question of the regulation of the production of cane be referred to it. A sub-Committee consisting of members from such associations as the Sugar Millers Association, the Sugar Syndicate, etc., should discuss the matter informally beforehand and put up concrete suggestions for the consideration of the All-India Conference.	3. The Governing Body strongly recommended to the Government of India that an All-India Sugar Conference be called and suggested that the Provincial Governments, Associations, etc., be asked to send their suggestions to the Imperial Council of Agricultural Research for being placed befor a special Sub-committee to be appointed for putting up concrete draft resolutions for consideration by the Conference.	3. (*i*) The recommendaion of the Governing Body was accepted by the Government of India and suggestions for consideration by the Provincial Governments and others were received, but on account of the present unsettled conditions the holding of such a conference has been postponed. (*ii*) As the proposed All-India Sugar Conference is not being held at present, the question of over-production of sugarcane has been resubmitted for consideration by the Sugar Committee.
4. Factories should be assigned suitable zones (page 44).	4. Accepted	4. Approved *generally* .	4. To be placed before the proposed All-India Sugar Conference.

Serial No.	Brief subject.	Recommendation.	Decision of the Governing Body.	Action taken.
1	2	3	4	5
	5. In a zone, steps should be taken (*a*) to improve the roads (page 37), (*b*) to avoid employing purchasing agents (page 43) and (*c*) to make premium payments for special varieties of cane (page 45).	5. It was recommended that in a zone steps should be taken (*a*) to improve the roads, but factory owners considered that Government should pay for it in Bihar and the United Provinces, where a special cess is levied, (*b*) to avoid employing purchasing agents in the zoned areas. It was further agreed to refer the question of making premium payments for better cane to the proposed All-India Conference. The difficulty, of defining 'special varieties' of cane was recognised.	5. Approved *generally* .	5. To be placed before the proposed All-India Sugar Conference.
	6. The freight rates on cane on the different railway systems should be adjusted (page 39).	6. The Committee recommended that the Council should make suitable recommendations to the Railway Board to adjust the freight rates on cane on the different railway systems.	6. Ditto . .	6. The recommendations have been forwarded to the Railway Board, who are considering the question.
	7. There should be legislation for zoning the licensing of factories and the appointment of controlling bodies (page 47); a change in the territorial distribution of the production of sugar will create a new problem (page 39).	7. This should be referred to the proposed All-India Conference.	7. Ditto . .	7. The question of holding the All-India Conference has been postponed for the present.

8. The railway freight on limestone for carbonitation factories should be reduced (page 59).	8. The Committee endorsed the views of the Tariff Board in regard to the reduction of the railway freight on line and recommended that limestone should also be included in this and the concession should be made not only for carbonitation factories as recommended by the Tariff Board but for all sugar factories. The Committee further agreed that where there were more than one system of railways, a combined rate should be decided upon.	8. Ditto . .	8. The recommendations have been forwarded to the Railway Board, who are considering the question.
9. Research on technical processes of manufacture should be continued (Rec. 40) and a suitable qualified staff appointed at the Sugar Institute (page 45).	9. The Committee endorsed the recommendation of the Tariff Board for continuing the research on technical processes of manufacture and further recommended that the scope of the work of the Institute should include sugar-candy, confectionery and other industries subsidiary to sugar.	9. Ditto . .	9. A scheme for research on the manufacture of Confectionery has been prepared by the Director, I. I. S. T., and for consideration by the Sugar Committee.
10. Factories should be under an obligation to employ fully qualified men on adequate salaries and legislation should be introduced for the purposes on the lines of the British Sugar Re-organisation Act (page 76 and summary 42).	10. The Committee agreed with the recommendations of the Tariff Board and recommended that factories should be asked to employ fully qualified men on adequate salaries and give them a suitable retaining fee during the off season.	10. Ditto . .	10. The Provincial Governments, Indian Sugar Mills Association, Indian Sugar Producers' Association and Indian Sugar Syndicate have been addressed on the subject.
11. Wider pipes should be used for improving the quality of molasses (page 106).	11. No specific action is called for .	11. Ditto . .	11. No. action.

Serial No.	Brief subject.	Recommendation.	Decision of the Governing Body.	Action taken.
1	2	3	4	5
	12. The possibility of establishing industries subsidiary to sugar should be investigated (summary 43).	12. This should be referred to the All-India Conference and that Mr. Srivastava should put up a note on the subject for the consideration of the Conference.	12. Approved *generally* .	12. To be placed befored the All-India Sugar Conference.
	13. A marketing survey of the sugar industry should be undertaken so that accurate and complete statistical information may be available (summary 41).	13. Necessary data is being collected by the Marketing Branch of the Imperial Council of Agricultural Research.	13. Ditto . .	13. No action.
	14. Grades of sugar should be standardised.	14. Already receiving attention by the Director, Imperial Institute of Sugar Technology, Cawnpore.	14. Ditto . .	14. No. Action.
	15. The industry should be rationalised under some form of State control (summary 50) and a central organisation established for marketing (page 130).	15. The Committee recommended that the question of rationalising the Industry under some form of State control and the establishment of a central marketing organisation be referred to the proposed All-India Conference. It was further agreed that in this connection concrete proposals for the constitution of the All-India Sugar Committee on the lines of the Indian Central Cotton Committee should be put up at an early date.	15. The proposal for the establishment of an Indian Central Sugar Committee was approved in principle and it was decided that views of all concerned regarding the constitution, functions and finances of the proposed Committee should be obtained and examined by a special Sub-Committee which should submit its report to the Governing Body.	15. The Provincial and State Governments and Associations concerned were addressed. All excepting the Governments of the United Provinces, the Central Provinces and Hyderabad, and the All-India Sugar Syndicate have sent in their replies. The Governments of Madras and Bhopal consider the present to be most inopportune time for embarking upon this very expensive scheme. All other Governments welcome the proposal for the estab-

			lishment of the Central Sugar Committee. As regards its constitution, the existing constitution of the Sugar Committee of the I. C. A. R. with a few modifications similar to the personnel of the Indian Central Jute Committee or Indian Central Cotton Committee has been recommended. The replies indicate a general agreement that the Committee should consider questions of research (technological, economic and agricultural), development and marketing. Some of the Governments favour the attachment of the I. I. S. T. to the Central Committee. There is a concensus of opinion that the Committee should be financed from the Sugar Excise Fund which should be placed at its disposal and that no separate cess is needed.
16. The possibility of the export of sugar should be examined after the lapse of the present sugar agreement (page 135).	16. The matter should be examined by the proposed All-India Conference.	16. Approved *generally* .	16. The questions of holding the proposed All-India Sugar Conference has been postponed for the present.
17. The nutritive quality of sugar should be compared with that of *gur* (page 55).	17. The Committee noted that some work on the comparative nutritive value of sugar and *gur* was being carried out at Conoor and the Imperial Agricultural Research Institute and suggested that this should be followed up by actual experimentations of feeding by nutritive experts.	17. Ditto . .	17. The Director, I. A. R. I., and Director, Nutrition Research Laboratories, have been addressed.

Serial No.	Brief subject.	Recommendation.	Decision of the Governing Body.	Action taken.
1	2	3	4	5
	18. Experiments on improved methods of *gur* manufacture should be continued (summary 34) and the effect of manure on the keeping quality of *gur* investigated (page 51).	18. The work is already in progress at Bilari under the direction of the Director, Imperial Institute of Sugar Technology.	18. Approved *generally* .	18. No action.
	19. Adequate funds should be provided for research and assistance to Provincial Agricultural Departments (summary 39 and page 143) and the sugar industry should help in providing the same by a special cess (page 143).	19. The general opinion was that the Sugar Industry was already heavily taxed and it could not agree to another cess for the purpose of providing funds for research.	19. Ditto . .	19. To be placed before the proposed All-India Sugar Conference.
25	Draft instructions for sampling in connection with ratooning experiments in the United Provinces and Bihar.	Instructions should be examined by a special sub-committee, the report of which should be considered by the Advisory Board.	....	The report of the Sub-Committee was approved by the Advisory Board. The instructions have been communicated to the Governments of the United Provinces and Bihar.
26	Publicity to the proceedings of the Sugar Committee.	Only recommendations of the Committee should be communicated to the Press without in any way referring to the discussion that had taken place.	....	Noted.

APPENDIX XV.

PUBLICATIONS OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, INDIA

[Prices are inclusive of packing and Indian postage]

1. Indian Farming

A monthly journal of agriculture and animal husbandry for the general reader interested in agriculture or livestock in India or the Tropics (Prepayable subscription Rs. 6 or 9*s*. 6*d*. per annum. Price per part 8 annas).

(Replaced, ' Agriculture and Live-stock in India ' with effect from 1940, of which volumes I– IX complete are available.)

2. The Indian Journal of Agricultural Science

ICAR. 5. A bi-monthly scientific journal of agriculture and the allied sciences, mainly devoted to the publication of the results of original research and field experiments. (Established 1931. Published in February, April, June, August, October and December. Prepayable subscription Rs. 15 or 23*s*. 6*d* per annum. Price per part Rs. 3 or 5*s*. 3*d*.). Volumes I to IX complete are available.

3. The Indian Journal of Veterinary Science and Animal Husbandry

ICAR. 6. A quarterly journal for the publication of scientific matter relating to the health, nutrition and breeding of live-stock. (Established 1931. Published in March, June, September and December. Prepayable subscription Rs. 6 or 9*s*. 6*d*. Price per part Rs. 2 or 3*s*. 6*d*.). Volumes I to IX complete are available.

4. Scientific Monographs of the Imperial Council of Agricultural Research

ICAR. 10-1 No. 1. The Fungi of India. By E. J. Butler, C.I.E., D.Sc., M.B. F.R.S., and G. R. Bisby, Ph.D. (1931). Price Rs. 6-12-0 or 11*s*.

ICAR. 10-2 No. 2. Life-histories of Indian Microlepidoptera, Second Series Alucitidæ (Peterophoridæ, Tortricina and Gelechiadæ). By T. Bainbrigge Fletcher, R.N., F.L.S., F.E.S., F.Z.S. (1932). Price Rs. 3-4-0 or 5*s*. 6*d*.

ICAR. 10-3 No. 3. The Open Pan System of White-Sugar Manufacture. By R. C. Srivastava, B.Sc. (1935, 2nd edition). Price Rs. 3-2 or 5*s*. 6*d*.

ICAR. 10-4 No. 4. Life histories of Indian Microlepidoptera; Cosmopterygidæ to Neopseustidæ. By T. Bainbrigge Fletcher, R.N., F.L.S., F.E.S., F.Z.S. (1933). Price Rs. 4-8-0 or 7*s*. 6*d*.

ICAR. 10-5 No. 5. The Bombay Grasses. By E. J. Blatter, S. J., PH.D., F.L.S., and C. McCann, F.L.S. Illustrated by R. K. Bhide. (1935). Price Rs. 20-12-0 or 32*s*. 6*d*.

ICAR. 10-6 No. 6. Helminth Parasites of the Domesticated Animals in India. By G. D. Bhalerao, M.Sc. (1935). Price Rs. 7-12-0 or 13*s*. 3*d*.

ICAR. 10-7 No. 7. Influence of Manures on the Wilt Disease of *Cajanus indicus* Spreng., and the Isolation of Types Resistant to the Disease. By W. McRae, M.A., D.Sc. (Edin.), F.L.S. and F. J. F. Shaw D.Sc. (Lond.), A.R.C.S., F.L.S. (1933). Price Rs. 2-4-0 or 4*s*. 3*d*.

ICAR. 10-8 No. 8. The Silk Industry of Japan with Notes on Observations in the United States of America, England, France and Italy. By C. C. Ghosh, B.A., F.E.S. (1933). Price Rs. 4 or 6*s*. 9*d*.

ICAR. 10-9 No. 9. Mechanical Cultivation in India. A History of the Large-scale Experiments carried out by Burmah-Shell Oil Storage and Distributing Company of India, Ltd. By C. P. G. Wade. (1935). Price Rs. 3-14-0 or 6*s*. 6*d*.

ICAR. 10-10 No. 10. The Spotted Boll Worms of Cotton (*Earias fabia* Stoll and *Earias insulana* Boisd.) in South Gujarat, Bombay Presidency. (Final report on investigations financed by the Indian Central Cotton Committee, 1923-1931). By B. P. Deshpande, M.Ag. and N. T. Nadkarny, B.Ag. (1936). Price Rs. 5-14-0 or 9*s*. 6*d*.

ICAR. 10-11 No. 11. Investigations on the Course and Distribution of the Nerves supplying Levator anguli scapuli and Rhomboideus muscles and the formation of the Phrenic Nerve in the Ox with Observations on certain Anatomical Deviations. By H. N. Chelva Ayyangar, G.M.V.C. (1937). Price Rs. 4-10-0 or 7*s*. 9*d*.

ICAR. 10-12 No. 12. The Fungi of India, Supplement I. By B. B. Mundkur (1938). Price Re. 1-6-0 or 2*s*. 3*d*.

ICAR. 10-13 No. 13. Further Observations on Anatomical Deviations in the Ox and Note on certain Anatomical Freaks. By H. N. Chelva Ayyangar, G.M.V.C. Price Rs. 2-8-0 or 4*s*.

ICAR. 10-14 No. 14. Further studies in Cereal Rusts in India. By K. C. Mehta, M.Sc., Ph.D. (*In press*).

ICAR. 10-15 No. 15. Poisonous Plants of India. By Bt. Col. R. N. Chopra. (*In press*).

5. Miscellaneous Bulletins of the Imperial Council of Agricultural Research

ICAR. 8-1 No. 1. List of Publications on Indian Entomology, 1930. Compiled by the Imperial Entomologist, Pusa. (1934). Price As. 14 or 1*s*. 6*d*.

ICAR. 8-2 No. 2. List of Publications on Indian Entomology, 1931. Compiled by the Imperial Entomologist, Pusa. (1934). Price As. 8 or 10*d*.

ICAR. 8-3 No. 3. List of Publications on Indian Entomology, 1932. Compiled by the Imperial Entomologist, Pusa. (1934). Price As. 12 or 1*s*. 3*d*.

ICAR. 8-4 No. 4. Host Plant Index of Indo-Ceylonese Coccidæ. By S. Ramachandran, L.Ag. and T. V. Ramakrishna Ayyar, B.A., PH.D., F.Z.S. (1934). Price Re. 1-10-0 or 2*s*. 9*d*.

ICAR. 8-5 No. 5. List of Publications on Indian Entomology, 1933. Compiled by the Officiating Imperial Entomologist, Pusa. (1935). Price As. 9 or 1*s*.

ICAR. 8-6 No. 6. Bee-keeping. By C. C. Ghosh, B.A., F.R.E.S. (4th edition). (1939). Price Re. 1-14-0 or 3*s*. 3*d*.

ICAR. 8-7 No. 7. List of Publications on Indian Entomology, 1934. Compiled by the Imperial Entomologist, Pusa. (1935). Price Re. 1-2-0 or 2*s*.

ICAR. 8-8 No. 8. Selected Clinical Articles, Part I. By G. K. Sharma, G.P.V.C. and R. L. Kaura, B.V.Sc., M.R.C.V.S. (1936). Price As. 8 or 10*d*.

ICAR. 8-9 No. 9. Statistical Methods and their Application to Agronom, A bibliography. Compiled by K. K. Guha Roy, B.A. (1936). Price Rs. 2-2-0 or 4*s*.

ICAR. 8-10 No. 10. Diseases of Sugarcane and Methods for their Control. By L S. Subramaniam. (1936). Price Re. 1-14-0 or 3*s*. 3*d*.

ICAR. 8-11 No. 11. Tables of Standard Errors of Mendelian Ratios. Compiled by Swarn Singh Purewal, M.Sc., Ph.D. and Krishna Rao, L.Ag. (1936). Price As. 12 or 1*s*. 3*d*.

ICAR. 8-12 No. 12. List of Publications on the Botany of Indian Crops, Part II, for the period 1928-32. Compiled by R. D. Bose, B.Sc. (1936). Price Rs. 3-6-0 or 5*s*. 9*d*.

ICAR. 8-13 No. 13. Two New Statistical Tables based upon Fisher's '*t*'. By M. Vaidyanathan, M.A. (1936). Price As. 6 or 8*d*.

ICAR. 8-14 No. 14. List of Publications on Indian Entomology (1935). Compiled by the Imperial Entomologist, Pusa. (1936). Price Re. 1-4-0 or 2*s*.

ICAR. 8-15 No. 15. Selected Clinical Articles, Part II. By G. K. Sharma; R. L. Kaura; S. Ganapathy Iyer; G. S. Khan, and M. Y. Mangrulkar. (1937). Price Re. 1-4-0 or 2*s*.

ICAR. 8-16 No. 16. Indian Grazing Conditions and the Mineral Contents of some Indian Fodders. By P. E. Lander, M.A., D.Sc., F.I.C., I.A.S. (1937). Price Rs. 3-14-0 or 6*s*. 9*d*.

ICAR. 8-17 No. 17. A Brief Survey of some of the important Breeds of Cattle in India. By Col. Sir Arthur Olver, C.B., C.M.G., F.R.C.V.S., F.N.I. (1938). Price Rs. 2 or 3*s*. 6*d*.

ICAR. 8-18 No. 18. Milk Records of Cattle in Approved Dairy Farms in India. By K. P. R. Kartha, B.A. (1938). Price Rs. 2-12-0 or 4*s*. 6*d*.

ICAR. 8-19 No. 19. A Preliminary Annotated List of the Fruit Pests of the North-West Frontier Province. By Hem Singh Pruthi, M.Sc., Ph.D. (Cantab.), F.N.I. and H. N. Batra, B.Sc., Assoc. I.A.R.I. (1938). Price Re. 1 or 1*s*. 9*d*.

ICAR. 8-20 No. 20. Report on an Enquiry into the Cultivation of Cloves in India By A. K. Yegna Narayana Iyer, M.A. (Madras), Dip. Agri. (Cantab.) N. D. D. (England) (1938). Price Rs. 2-4-0 or 3*s*. 9*d*.

ICAR 8-21 No. 21. Investigations on the Cold Storage of Mangoes. By G. S. Cheema, D.Sc., I.A.S., D. V. Karmarkar, M.Sc., Ph.D., A.I.I.Sc. and B. M. Joshi, M.Sc. (1939). Price Rs. 3-12-0 or 6*s*.

ICAR. 8-22 No. 22. Report on a Village Enquiry regarding Cattle and the Production and Consumption of Milk in Seven Breeding Tracts of India (1939). Price Rs. 3-8-0 or 5*s*. 6*d*.

ICAR. 8-23 No. 23. The Cold Storage of Fruits and Vegetables. By G. S. Cheema, D.Sc., I.A.S. and D. V. Karmarkar, M.Sc., Ph.D., A.I.I.Sc. (1939). Price As. 10 or 1*s*.

ICAR. 8-24 No. 24. A brief Survey of some of the Important Breeds of Cattle in India. Part II. Prize Winners at the First All-India Cattle Show (1939). Price Re. 1-6-0 or 2*s*.

ICAR. 8-25 No. 25. The Nutritive values of Indian Cattle Foods and the Feeding of Animals. By K. C. Sen, D.Sc. (1939). Price As. 7 or 8*d*.

ICAR. 8-26 No. 26. The Progress of Agricultural Science in India during the Past Twenty five years. By W. Burns, C.I.E., D.Sc. (Edin.), I.A.S. (1939). Price Re. 1-8-0 or 2*s*. 3*d*.

ICAR. 8-27 No. 27. Definition of Characteristics of Seven Breeds of Cattle of All India Importance. (1939). Price Re. 1-10-0 or 2*s*. 6*d*.

ICAR. 8-28 No. 28. Bibliography of Soil Erosion. By R. M. Gorrie, D.Sc (1939). Price Re. 1-12-0 or 2*s*. 6*d*.

ICAR. 8-29 No. 29. Report on the Prospects of Cinchona Cultivation in India, By A. Wilson, M.A., B.Sc., I.A.S. and T. J. Mirchandani, M.Sc., Ph.D. (1939). Price Rs. 2-6-0 or 4*s*.

ICAR. 8-30 No. 30. Biological Notes on Indian Chalcidoidea. By Hem Singh Pruthi, M.Sc., Ph.D. (Cantab.), F.N.I. and M. S. Mani. (1940). Price Rs. 3-6-0 or 5*s*. 6*d*.

ICAR. 8-31 No. 31. Studies in the Preservation of Fruit and Vegetables: An Investigation on the Methods of Preparation and Standardization of Tomato Ketchup. By Lal Singh, B.Sc. (Hons.) M.Sc. (Calif.) and Girdhari Lal, Ph.D. (London), D.I.C. (1940). Price As. 7 or 8*d*.

ICAR. 8-32 No. 32. Studies in the Preservation of Fruit Juices, I. Some Observations on the preparation and preservation of Citrus Fruit Squashes. By Lal Singh, B.Sc. (Hons.), M.Sc. (Calif.) and Girdhari Lal, Ph.D. (Lond.), D.I.C. (1940). Re. 1 or 1*s*. 3*d*.

ICAR. 8-33 No. 33. Selected Clinical Articles, Part III. By Mohammad Rahimuddin, G.M.V.C.; C. D. Uttangi, G.B.V.C.; R. C. Nathani, G.B.V.C., P.G. (Edin.), and N. S. Sankaranarayanan, G.M.V.C. Price As. 9 or 10d.

ICAR. 8-34 No. 34. Some Practical Results of Sugarcane Research in India. (*In press*).

ICAR. 8-35. No. 35. Progress of Veterinary Research in India during the Past Twenty-five Years. By F. Ware, C.I.E., I.V.S., F.N.I. (*In press*).

ICAR. 8-36 No. 36. Milk Records of Cattle in approved Dairy Farms in India, Vol. II, Part I—Cows, by K. P. R. Kartha. (*In press*).

ICAR. 8-37 No. 37. Milk Records of Cattle in approved Dairy Farms in India Vol. II, Part II—Buffaloes. (*In press*).

ICAR. 8-38 No. 38. Manuring of Paddy, by R. L. Sethi, I.A.S. (*In press*).

ICAR. 8-39 No. 39. Studies in the preservation of Fruit Juices, II, by Lal Singh and Girdhari Lal. (*In press*).

ICAR. 8-40 No. 40. Grape growing in Baluchistan, by A. M. Mustafa.

6. Annual Report of the Imperial Council of Agricultural Research

ICAR. 12-31 Annual Report of the Imperial Council of Agricultural Research for the years 1929-30 and 1930-31. Price As. 12 or 1*s*. 3*d*.

ICAR. 12-32 Annual Report of the Imperial Council of Agricultural Research for the year 1931-32. Price As. 6 or 8*d*.

ICAR. 12-33 Annual Report of the Imperial Council of Agricultural Research for the year 1932-33. Price As. 6 or 8*d*.

ICAR. 12-34 Annual Report of the Imperial Council of Agricultural Research for the year 1933-34. Price Re. 1-8-0 or 2*s*. 6*d*.

ICAR. 12-35 Annual Report of the Imperial Council of Agricultural Research for the year 1934-35. Price Re. 1 or 1*s*. 9*d*.

ICAR. 12-36 Annual Report of the Imperial Council of Agricultural Research for the year 1935-36. Price As. 14 or 1*s*. 6*d*.

ICAR. 12-37 Annual Report of the Imperial Council of Agricultural Research for the year 1936-37. Price Re. 1-2-0 or 2*s*.

ICAR. 12-38 Annual Report of the Imperial Council of Agricultural Research for the year 1937-38. Price As. 12 or 1*s*.

ICAR. 12-39 Annual Report of the Imperial Council of Agricultural Research for the year 1938-39. Price Re. 1-8-0 or 2*s* 3*d*.

7. Agriculture and Animal Husbandry in India (called Review of Agricultural Operations in India up to 1933)

ICAR. 9-29 Review of Agricultural Operations in India, 1928-29. Price Rs. 3-2-0 or 5*s*. 6*d*.

ICAR. 9-31 Review of Agricultural Operations in India, 1929-31. Price Rs. 5-0-0 or 8*s*. 3*d*.

ICAR. 9-33 Review of Agricultural Operations in India, 1931-33. Price Rs. 5-12-0 or 9*s*. 6*d*.

Agriculture and Animal Husbandry in India, 1933-34 and 1934-35—

ICAR. 13-1-35 Part I.—Crop Production. Price Rs. 4-14-0 or 8*s*

ICAR. 13-2-35 Part II.—Animal Husbandry. Price Re. 1 or 1*s*. 9*d*.

ICAR. 13-36 Agriculture and Animal Husbandry in India, 1935-36. Price Rs. 4-10-0 or 7*s*. 9*d*.

ICAR. 13-37 Agriculture and Animal Husbandry in India, 1936-37. (1939). Price Rs. 7 or 11*s*.

ICAR. 13-38 Agriculture and Animal Husbandry in India, 1937-38. Price Rs. 5-14-0 or 9*s* 3*d*.

8. Proceedings of the Board of Agriculture and Animal Husbandry

ICAR. 2 Proceedings of the First Meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry held at New Delhi from the 20th to the 23rd February 1933, with Appendices. Price Rs. 5-14-0 or 9*s*. 6*d*.

ICAR. 3 — Proceedings of the First Meeting of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry held at Delhi from the 25th February to the 2nd March 1935, with Appendices. Price Rs. 6 or 9*s*. 9*d*.

ICAR. 2-2 — Proceedings of the Second Meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry held at Madras from the 14th to the 16th December 1936. (1938). Price Rs. 3-10-0 or 6*s*. 3*d*.

ICAR. 3-2. — Proceedings of the Second Meeting of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry held at Lahore from the 6th to the 9th December 1937, with Appendices. (1939). Price Rs. 4-2-0 or 6*s*. 6*d*.

Proceedings of the Third Meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India held at New Delhi from the 20th to the 23rd February 1939, with Appendices.

9. Marketing Series (Agricultural Marketing in India)

AMA. 1. — Report on the Marketing of Wheat in India (1937). Price Rs. 1-4-0 or 2*s*.

AMA. 2. — Report on the Cold Storage and Transport of Perishable Produce in Delhi (1937). Price As. 12 or 1*s*. 3*d*.

AMA. 3. — Agricultural Produce (Grading and Marking) Act, 1937, with rules made prior to 1st April 1937 (1937). Price As. 2.

AMA. 4. — Report on the Marketing of Wheat in India (Abridged edition). (1938). Price As. 8 or 10*d*.

AMA. 5. — Ditto. Hindi version (1938) Price As. 8 or 10*d*.

AMA. 6. — Ditto. Urdu version (1938). Price As. 8 or 10.

AMA. 7. — Annual Report of the Agricultural Marketing Adviser and Summarised Reports of the Senior Marketing Officers in Provinces and certain States for the year ending 31st December 1937. (1938). Price As. 6 or 8*d*.

AMA. 8. — Report on the Marketing of Linseed in India, 1938. Price Re. 1-4 or 2*s*.

AMA. 9. — Report on the Marketing of Eggs in India and Burma (1938). Price Re. 1-4 or 2*s*.

AMA. 10. — Report on the Marketing of Tobacco in India and Burma (1939). Price Re 1-4 or 2*s*.

AMA. 12. — Report on the Marketing of Linseed in India (Abridged edition). (1939). Price As. 8 or 10*d*.

(Note.—A.M.A. 11 is not yet issued.)

10.— Catalogue of Indian Insects

The following Parts have been issued :—

ICAR. 11-1 — 1. Acrydidæ (Tettigidæ), by T. Bainbrigge Fletcher, 1921. Price Anna 1.

ICAR. 11-2 — 2. Culicidæ, by R. Senior-White. 1923. Price Re. 1-10.

ICAR. 11-3 — 3. Bombyliidæ, by R. Senior-White. 1923. Price As. .

ICAR. 11-4 — 4. Trypetidæ (Trypaneidæ), by R. Senior-White. 1924. Price As. 8.

ICAR. 11-5 — 5. Nitidulidæ, by S. N. Chatterjee. 1924. Price As. 10.

ICAR. 11-6 — 6. Staphylinidæ, by M. Cameron. 1925. Price Re. 1-14.

ICAR. 11-7 — 7. Lasiocampidæ, by T. Bainbrigge Fletcher. 1925. Price As. 12.

ICAR. 11-8 — 8. Amatidæ (Syntomidæ), by T. Bainbrigge Fletcher. 1925. Price As. 12.

ICAR. 11-9	9. Zygænidæ, by T. Bainbrigge Fletcher. 1925. Price Re. 1-5.
ICAR. 11-10	10. Stephanidæ, by G. R. Dutt. 1925. Price Re. 1-2.
ICAR. 11-11	11. Brenthidæ, by Richard Kleine. 1926. Price Re. 1-2.
ICAR. 11-12	12. Tabanidæ, by R. Senior-White. 1927. Price Re. 1-12.
ICAR. 11-13	13. Cicindelidæ, by Merica Heynes-Wood and Cedric Dover. 1928. Price Rs. 2-8.
ICAR. 11-14	14. Palpicornia, by A. d'Orchymont. 1928. Price Rs. 2-8.
ICAR. 11-15	15. Cecidomyidæ, by R. Senior-White. 1928. Price As. 7.
ICAR. 11-16	16. Cosmopterygidæ, by T. Bainbrigge Fletcher. 1928. Price As. 10
ICAR. 11-17	17. Yponomeutidæ, by T. Bainbrigge Fletcher. 1928. Price As. 8.
ICAR. 11-18	18. Carabidæ, by H. E. Andrewes. 1931. Price Rs. 8-10.
ICAR. 11-19	19. Gyrinoidea, by George Ochs. 1930. Price As. 12.
ICAR. 11-20	20. Alucitidæ (Pterophoridæ), by T. Bainbrigge Fletcher. 1931. Price Re. 1-6.
ICAR. 11-21	21. Lycidæ, by R. Kleine. 1931. Price Re. 1-2.
ICAR. 11-22	22. Phaloniadæ and Chlidanotidæ, by T. Bainbrigge Fletcher. 1931. Price As. 6.
ICAR. 11-23	23. Chalcidoidea, by M. S. Mani, M.A. (Res.), 1937. Price Rs. 3-2 or 5*s*. 6*d*.
ICAR. 11-24	24. Evanidæ, by M. S. Mani, M.A. (1940). Price As. 7 or 8*d*.

11.— Miscellaneous

VRI. 1.	A Description of the Imperial Institute of Veterinary Research, Mukteswar, and its Sub-station, the Imperial Veterinary Serum Institute, Izatnagar. By F. Ware, F.R.C.V.S., I.V.S. Price Re. 1-4-0 or 2*s*.
ARI. 7-187	The Production of Cigarette Tobacco by Flue-curing. By F. J. F. Shaw, C.I.E., D.Sc., A.R.C.S., F.L.S. and Kashi Ram. *Imp. Inst. Agri. Res., Pusa Bull.* No. 187. Reprinted (1935). Price Re. 1 or 1*s*. 9*d*.
ICAR. 16.	A Handbook of Statistics for use in Plant Breeding and Agricultural Problems. By F. J. F. Shaw, C.I.E., D.Sc., A.R.C.S., F.L.S. Price Rs. 4-6-0 or 7*s*. 3*d*.
ICAR. 7.	Report on the Work of the Imperial Council of Agricultural Research in Applying Science to Crop Production in India. By Sir John Russell, D.Sc., F.R.S. Price Re. 1-14 or 3*s*. 3*d*.
ICAR. 18.	Report on the Development of the Cattle and Dairy Industries of India. By Norman C. Wright, M.A., D.Sc., Ph.D. Price Re. 1-8-0 or 2*s*. 6*d*.
ICAR. 19-I.	Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. I. The Punjab (1938). Price Rs. 13-6 or 21*s*. 6*d*.
ICAR. 19-II.	Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. II. Bombay, (1938). Price Rs. 10-12 or 17*s*.
ICAR. 19-III.	Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. III. United Provinces (1939). Price Rs. 12-4 or 19*s*.
ICAR. 19-IV.	Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India. Vol. IV. Madras (1938). Price Rs. 9-4-or 14*s*. 6*d*.
ICAR. 19-V	Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. V. Bihar (1938). Price Rs. 8-4 or 13*s*.
ICAR. 19-VI.	Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. VI. Bengal (1938). Price Rs. 6-10 or 10*s*. 3*d*.
ICAR. 19. VII.	Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. VII. Central Provinces and Berar (1939). Price Rs. 10-2 or 16*s*.

ICAR. 19-VIII. Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. VIII. Sind (1939). Price Rs. 4 or 6*s*. 6*d*.

ICAR. 19-IX Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India, Vol. IX. States of Hyderabad, Baroda and Mysore. Price Rs. 8-8-0 or 13*s*. 6*d*.

ICAR. 20-I Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India—Supplementary, Vol. I (The Punjab). Price Rs. 17 or 26*s*. 6*d*.

ICAR. 20-II Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India—Supplementary, Vol. II. (Bombay). Price Rs. 14-6-0 or 22*s*. 6*d*.

ICAR. 20-IV Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India—Supplementary, Vol. IV. (Madras). Price Rs. 11-6-0 or 18*s*.

ICAR. 20-VIII Report on the Cost of Production of Crops in the Principal Sugarcane and Cotton Tracts in India—Supplementary, Vol. VIII. (Sind). Price Rs. 4-6-0 or 7*s*.

Copies of the above publications can be had from the Manager of Publications, Civil Lines, Delhi and from any of the Agents, a list of whom will be found on the inside page of the front cover. Prices are inclusive of packing and Indian postage.

Purchasers not residing in Asia, should apply to the High Commissioner for India, India House, Aldwych, London.

Note.—When indenting please give only the symbol preceding the name of the publications.

APPENDIX XVI.

Books and Publications received as Library exchanges.

Names of countries.	Number of books and publications, etc., received.	Number of of periodicals received.
1. Afghanistan	..	1
2. Africa	207	7
3. Argentina	20	3
4. Australia	47	3
5. Austria	1	1
6. Belgium	8	3
7. Baluchistan	3	..
8. Brazil	2	6
9. British Guiana	..	1
10. Burma	6	1
11. Canada	59	7
12. Ceylon	6	2
13. China	1	4
14. Cyprus	4	1
15. Czechoslovakia	2	1
16. Denmark	5	1
17. Dutch East Indies	10	2
18. Egypt.	71	1
19. Fiji	1	1
20. Finland	49	1
21. France	28	6
22. Germany	6	6
23. Goutamala	1	..
24. Great Britain	392	38
25. Holland	16	2
26. India—		
(1) Central and Local Governments	406	37
(2) Private Bodies and States	396	84
27. Indo-China	1	1
28. International Institute of Agriculture, Rome	76	10
29. Italy	6	4
30. Japan	..	3
31. League of Nations	59	10
32. Malta	1	..
33. New Zealand	6	2
34. Norway	3	2
35. Palestine	1	1
36. Panama	1	..
37. Philippines	15	4
38. Portugal	1	1
39. Roumania	1	1
40. Russia	10	10
41. Siam	4	..
42. Straits Settlement and Federated Malay States	28	5
43. Sweden	2	1
44. Switzerland	4	1
45. United States of America	393	10
46. West Indies.	28	6
Total	2,387	292

APPENDIX XVII.

List of Journals received in the Library, Imperial Council of Agricultural Research.

Agricultural Engineering.

1. AGRICULTURAL ENGINEERING. (1937—).
2. IMPLEMENT AND MACHINERY REVIEW (England). Vol. 55. (1930 —).

Agriculture.

3. AGRICOLTURA COLONIALE (Italy). Vol. 28. (1934 —).
4. AGRICULTURA SINICA (China). Vol. 1. (1934 —).
5. AGRICULTURAL GAZETTE OF NEW SOUTH WALES. (VOL. 42. 1933 —).
6. AGRICULTURAL INDEX. (U. S. A.). (1916 —).
7. AGRICULTURAL JOURNAL, Fiji. Vol. 3. (1930 —).
8. AGRICULTURAL JOURNAL OF BRITISH GUIANA, Vol. 1. (1929 —).
9. AGRICULTURE NOTES (PUERTO RICO AGRIL. EXP. STATION). (1936—).
10. AGRICULTURE AND ANIMAL HUSBANDRY IN INDIA 1933-34—(CONTINUATION OF REVIEW OF AGRICULTURAL OPERATION IN INDIA. 1919 TO 1932—33).
11. AGRICULTURE AND LIVE-STOCK IN INDIA. Vols. 1—9. (1931—1939).
12. ALLAHABAD FARMER. Vol. 4. (1930 —).
13. ANNALS OF THE AGRICULTURAL COLLEGE OF SWEDEN.
14. BERICHTE DES O.—HARA INSTITUT FUR LANDWIRTS CHAFTLICHE. Vol. 5. (1931 —).
15. BIBLIOGRAPHY OF REFERENCES TO LITERATURE ON AGRICULTURE AND ALLIED SUBJECTS. VOL. 2. (1938—).
16. BULLETIN OF MIYAZAKI COLLEGE OF AGRICULTURE AND FORESTRY. (1931 —).
17. BULLETIN OF THE CENTRAL EXPERIMENT STATION (Russia). Vol. 1. (1934 —).
18. BULLETIN OF THE IMPERIAL INSTITUTE, London. Vol. 1. (1903 —).
19. BULLETIN OF THE INDIAN TOBACCO ASSOCIATION, GUNTUR. (Madras presidency) Vol. 1. 1938—
20. BULLETINUL CULTIVAREI SI FERMANTAREI TITINULUI. (Bulletin de l' Institute Experimental pour la culture et la fermentation du tabac) (Rumania). Vol. 21. (1932 —).
21. CROP REPORTS (NATIONAL AGRICULTURAL RESEARCH BUREAU, CHINA). Vol. 3. (1935 —).
22. CYPRUS AGRICULTURAL JOURNAL. Vol. 25. (1930 —).
23. EAST AFRICAN AGRICULTURAL JOURNAL. (Nairobi). Vol. 1. (1935 —).
24. EMPIRE JOURNAL OF EXPERIMENTAL AGRICULTURE. (England). Vol. 1. (1933 —).
25. EXPERIMENT STATION RECORD. (U. S. Department of Agriculture). Vol. 1—19, 21, 27 and 62. (1930 —).
26. FARMER (Natal). Vol. 23. (1935—).
27. FARMING IN SOUTH AFRICA (Pretoria). Vol. 8 (1933 —).
28. FIELD, LONDON. (Vol. 174, No. 4532). Nov. 4, 1939—
29. FOREIGN AGRICULTURE. (U. S. Department of Agriculture), Washington.
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GLOSSARY.

Aman paddy	Winter rice (sown at the end of the rains and harvested in November).
Ata	Whole-meal flour.
Aus paddy	Early rice (sown with the early rains and harvested in August
Babul	Acacia arabica.
Bajra	Pearl millet (pennietum typhoideum).
Ber	Indian jujube (Zizyphus jujuba).
Bhasamanik	Name of a variety of paddy in Bengal.
Bhindi	Hibiscus esculentus.
Bhondu	Name of a variety of paddy in the C. P.
Budhiabako	Name of a variety of paddy in the C. P.
Bhusa	The husk or the chaff of grain ; the straw.
Bilichigan	Name of a variety of jowar.
Boro	Summer rice (Bengal).
Chhola	Gram (cicer arictinum).
Chikta	A physiological disease of jowar.
Dalua paddy	Summer paddy.
Desi	Indigenous.
Dorsa soil	A heavier type of soil in the Central Provinces with about 48 per cent. of clay.
Gosaba	A variety of rice in Bengal.
Gowallas	Milkmen.
Gowshalla	Cow-shed ; Refuge home for cattle.
Gooty	A new plant prepared by inducing rooting of a shoot by air layering.
Guara	Cyamopsis psoralioides ; a kharif leguminous crop.
Guava	Psidium guyava ; Linn.
Gundhi	Leptocorisa varicorious—an insect which attacks paddy flower.
Gur	Unrefined Indian sugar ; jaggery.
Gurmatia	A variety of rice in the C. P.
Hookah	Indian smoking pipe.
Jhanji	Algal weed.
Jhil	Small lake.
Juar	Sorghum (Andropogan Sorghum).
Kagazi	Variety of lemon (Citrus medica).
Kans	A coarse deep-rooted grass weed. (Saccharum spontaneum).
Khand	Sugar.
Khandsari	An open pan boiler in sugar industry.
Kharif	Crops sown at the beginning of the rains and reaped from October to December ; also applied to season.
Khesari	Lathyrus sativa.
Kiaries	Beds.
Litchees	A fruit (*Nephelium lappaceum* linn).
Luchai	A type of paddy in the C. P.
Malta	Malta orange (Citrus aurantium sinense, Gallesio).
Matsai soil	A type of light soil in the C. P.
Meth (or Moth)	Phaseolus aconitifolius.
Misri	Sugar candy.

Mosambi	Corruption of mozambique—a variety of orange.
Muddinaudyal	A type of jowar.
Nagkesar	A variety of paddy in the C. P.
Ord (or urd)	Phaseolus mungo Vov. Roxbunghii.
Pan	piper beetle.
Papaya	A fruit (carica papaya).
Parewa	A variety of rice in the C. P.
Patnai	A name given by commerce to a certain type of rice grown chiefly in Bengal and Bihar.
Patwaria	Name for late varieties of sunn in Bihar.
Peepal	Ficus Religiosa.
Rab	Massecuite.
Rabi	Crops sown in the autumn and reaped at the end of the cold weather ; also applied to the season.
Rani Jowar	A type of jowar.
Raya	Brassica juncea.
Sanai	Crotolaria juncea.
Sann	Crotolaria juncea.
Santra	Orange.
Sarson	Brassica compestis var. sarson.
Sathi	A coarse variety of rice the flowers of which are enclosed inside a sheath.
Shevri	Sesbania aculeata.
Shisham	Dalbergia sisso.
Siroo grass	A type of grass in the U. P.
Surra	bovine trypanosomiasis.
Toria	Brassica Napus Var. dichotoma.
Vayupotlu	Pheunatic pain.

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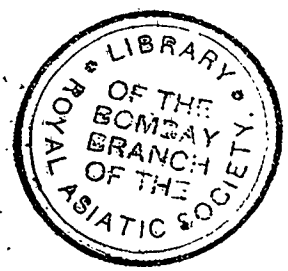

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CONTENTS

PAGE.

CHAPTER I—ADMINISTRATION—

Secretariat of the Council 1
Constituent Indian States 1
Meetings—
(*i*) Annual General Meeting 1
(*ii*) Governing Body 1
(*iii*) Advisory Board 1
(*iv*) Committees 1
Committees 2
Touring 4
Finance and Accounts 4

CHAPTER II—AGRICULTURAL RESEARCH—

Rice 5
Wheat and Barley 10
Millets and Pulses 11
Oilseeds 12
Tobacco 15
Fruit 16
Vegetables 24
Fibres 25
Miscellaneous crops 26
Soil Science 28
Agronomy 31
Physiology 33
Entomology 34
Pathology 36
Miscellaneous 37

CHAPTER III—ANIMAL HUSBANDRY RESEARCH—

Cattle Breeding 39
Goat and Sheep Breeding 39
Animal Nutrition 43
Animal Diseases and Pests 47
Dairying 57
Poultry 61
Pisciculture 62
Wool 63
Animal Industry 64
The Animal Husbandry Wing Meeting 66

CHAPTER IV—COMBINED AGRICULTURAL AND ANIMAL HUSBANDRY—

Development 71
Fodder and Grazing 71
Statistics 74

CHAPTER V—GENERAL—

Library 77
Publications 79

	PAGE.
CHAPTER VI—SUGARCANE—	
General	83
Agriculture	84
Sugar Technology	86
Sugar Marketing	92
CHAPTER VII—	
Agricultural Marketing	93
APPENDICES—	
I. Governing Body, Advisory Board and Secretariat of the Council	95
II. Decisions of the Governing Body	99
III. Recommendations of the Advisory Board	110
VI. Personnel of Standing and *ad hoc* Committees	121
V. Personnel of Scientific and Commodity Committees	124
VI. Annual Accounts	132
VII. Statement of Expenditure	153
VIII. Financial position and allocation of funds	168
IX. Action taken on the recommendations of the Sugar Committee	170
X. Publications of the Imperial Council of Agricultural Research	181

IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH

Report, 1940-41

CHAPTER I—ADMINISTRATION

1. This is the eleventh report of the Imperial Council of Agricultural Research covering the period from the 1st April 1940 to the 31st March 1941, presented by the Governing Body of the Council under rule 64 of the Rules and Regulations of the Council.

2. *Secretariat of the Council.*—Mr. P. M. Kharegat, Mr. S. Basu, Dr. W. Burns and Mr. F. Ware held respectively the posts of the Vice-Chairman, Secretary to the Council, Agricultural Commissioner and Animal Husbandry Commissioner with the Government of India throughout the year. Rai Bahadur R. L. Sethi relinquished the post of Assistant Agricultural Expert on the 20th December 1940 and was succeeded by Mr. S. C. Roy. Mr. H. B. Shahi made over charge of the office of the Assistant Animal Husbandry Expert on the 2nd September 1940 and was succeeded by Mr. R. L. Kaura. The designations of the Assistant Agricultural Expert and the Assistant Animal Husbandry Expert were changed during the year to those of Assistant Agricultural Commissioner and Assistant Animal Husbandry Commissioner with the Government of India, respectively.

3. The composition of the Governing Body, the Advisory Board and the Secretariat of the Council at the end of the year is shown in Appendix I.

4. *Constituent Indian States.*—Hyderabad, Mysore, Baroda, Travancore Cochin, Bhopal and Kashmir States continued as constituent states of the Council. The Gwalior State was admitted as a constituent state of the Council and has agreed to pay the Council a donation of rupees one lakh in not more than five annual instalments.

5. *Meetings.*—(*i*) The Annual General Meeting of the Council was held on the 18th December, 1940 at which the Annual Report of the Council and the accounts of the Society for the preceding year were adopted.

(*ii*) The Governing Body met at Simla on the 27th and 28th August 1940 and again at Lucknow on the 18th December 1940. The matters which they considered and their decisions thereon are summarised in Appendix II.

(*iii*) The Advisory Board met twice, at Simla on the 27th to the 29th June and at New Delhi on the 15th and the 16th November 1940. The matters which they considered and their recommendations thereon are summarised in Appendix III.

(*iv*) The following committees appointed by the Governing Body, called " Standing Committees ", met on the dates specified against each :—

Committees	Dates
June 1940	
Sugar	17th, 18th and 19th.
Soil Science	21st.
Fodder and Grazing	22nd.

Committees.	Dates.
June 1940—*contd.*	
Dairying	24th.
Editorial	27th.
November 1940.	
Sugar	7th.

(*v*) The following committees appointed by the Advisory Board and called *ad hoc* committees were constituted and they met on the dates specified against each :—

Committees.	Dates.
June 1940.	
Variability in Wheat	20th.
Pulses	21st.
Economical and Statistical	
Benares Hindu University scheme	
Botanical and Physiological	24th.
Fish	25th.
Entomological and Pathological	
Agronomic	
Animal Breeding	
Fruit	26th.
Developmental Research	
Animal Pests and Diseases	
November 1940.	
Fruit Canning	8th.
Benares Hindu University scheme	11th.
Soil Science and Agronomy	
Wool	
Animal Nutrition	
Botanical and Physiological	12th and 13th.
Animal Breeding	12th.
Developmental Research	13th.
Milk and Milk Products	
Entomological and Pathological	14th.
Animal Diseases and Pests	

(*vi*) The following special committees also met during the year on the dates mentioned against each :—

Fodder and Grazing Sub-Committee	20th June 1940.
Special Sugar Entomological	5th November 1940.
Special Sugarcane Entomological	15th March 1941.

The personnel of the Standing Committees (including changes approved, if any) which met during the year are given in Appendix IV.

6. *Committees.*—In August 1940 the Governing Body decided to dissolve all Standing Committees except the Sugar and Editorial Committees and empowered the Advisory Board to set up instead such committees as it considered necessary provided that the membership of any such committee did not exceed 10 or in special cases 12, apart from the headquarters staff of the Council. The Board accordingly set up the following small scientific and commodity committees :—

Scientific Committees—

1. Soil Science.
2. Plant Mycology
3. Plant Entomology
4. Plant Breeding (Botanical)

Scientific Committees—contd.

5. Plant Physiology
6. Plant Management (Agronomy)
7. Developmental Research
8. Animal Breeding
9. Animal Diseases and Pests
10. Animal Nutrition

Commodity Committees—

1. Rice
2. Wheat and Barley
3. Pulses and Millets
4. Oilseeds
5. Tobacco
6. Fruit and Fruit Products
7. Vegetables (including potatoes)
8. Miscellaneous (including fibres, drugs and spices)
9. Fodder and Grazing
10. Milk and Milk Products
11. Wool
12. Poultry and Eggs
13. Livestock
14. Fish
15. Hides and Skins.

These committees will function upto the 31st March 1941. Their personnel is given in Appendix V. The function of the Commodity Committees is to advise as regards the general lines of research work required and being carried out as also to look into questions connected with the economics of the production of the commodity in question and its marketing.

7. The Governing Body also appointed in August 1940 a Central Agricultural and Livestock Economic Committee. The main function of this committee is to examine the various schemes submitted to the Governing Body with due regard to claims of the different sciences and commodities, in the light of prevailing or probable economic conditions in India and to prepare for the consideration of the Governing Body a statement of the order of priority and preference for these proposals. The personnel of the committee is as follows :—

1. The Vice-Chairman, Imperial Council of Agricultural Research (Mr. P. M. Kharegat, C. I. E., I. C. S.), *ex-officio* President
2. The Joint Secretary to the Government of India, Education, Health and Lands Department (Mr. G. S. Bozman, C. I. E., I. C. S.)
3. The Economic Adviser to the Government of India (Dr. T. E. Gregory, D. Sc.)

4 and 5. The two representatives of Chambers of Commerce on the Governing Body (Mr. R. Scherer and Mr. D. P. Khaitan)

6 and 7. Two representatives, one of agriculture and one of animal husbandry, nominated by the Chairman of the Governing Body [Mr. Abdul Bari Chaudhri, M. L. A. (Assam) and Mr. V. H. Patil, M. Sc., Ph. D. (Iowa, U. S. A.) of Patilwada, Shahada, W. Khandesh]

Secretary, Imperial Council of Agricultural Research, Secretary *ex-officio.*

The Committee met on the 30th November 1940.

8. As required by the provisions of section 7(1) of the Agricultural Produce Cess Act, 1940, a Standing Finance Committee with the following personnel was also set up during the year :—

1. Mr. P. M. Kharegat, C. I. E., I. C. S., Vice-Chairman, Imperial Council of Agricultural Research, *ex-officio*
2. Mr. A. C. Turner, C. I. E., I. C. S., Financial Adviser, Imperial Council of Agricultural Research, *ex-officio*
3. The Hon'ble Sir Chhotu Ram
4. The Hon'ble Mr. Hossain Imam
5. Mr. S. P. Rajagopalachari

The Hon'ble Sir Chhotu Ram was elected President of the Committee and it met on the 15th December 1940.

9. *Touring.*—The Vice-Chairman of the Council was on tour for 108 days during which he visited various places in the Punjab, Bihar and Assam. The Agricultural Commissioner toured for 58 days including visits to Orissa, Kotah and Bundi and the Animal Husbandry Commissioner for 81 days visiting Ajmer, the Punjab, the North-West Frontier Province, the United Provinces, Assam and Sind. The Secretary also toured for 42 days. They looked into the working of the various schemes in the provinces and constituent states which are being financed with the aid of grants from the Council. In addition visits were paid by the Animal Husbandry Commissioner to some states which are not members of the Council to advise them about animal husbandry and livestock improvement work.

10. *Finance and accounts.*—The following were the receipts from (*i*) the cess levied under the Agricultural Produce Cess Act and (*ii*) the grants received from the Government of India during the year :—

	Rs.	A.	P.
(*i*) Receipts from the cess	8,28,274	0	0
(*ii*) Grant for Provincial Marketing Scheme . . .	1,80,000	0	0
(*iii*) Grant from Sugar Excise Fund	3,00,000	0	0
	13,08,274	0	0

The audited accounts for the year are given in Appendix VI. Appendix VII contains details of expenditure incurred up to the end of the year on various research schemes financed by the Council and Appendix VIII shows the allocation of funds during the year against receipts—actual and expected.

Experiments in the control of the pyrilla pest of sugarcane by spraying

Posters issued by the Agricultural Marketing Adviser to the Government of India

CHAPTER II—AGRICULTURAL RESEARCH

A. Rice

12. *General.*—(*i*) At its meeting held in November 1940, the Advisory Board desired that a review of the work done so far should be made available to them when future lines of research were next considered. With the approval of the Director, Imperial Agricultural Research Institute, Dr. B. P. Pal, the Imperial Economic Botanist, was deputed to inspect at least a few of the more important stations which had been running for some years and to submit a report.

(*ii*) A bulletin on the subject of Manuring of Paddy was published by the Council during the year. The Advisory Board considered the results contained therein to be important and recommended that further experiments should be carried out to find out the economics of manuring of paddy with oilcakes on the basis of their nitrogen content. They also recommended that composting should be encouraged. The provincial and state Governments have been requested to follow up the matter further.

(*iii*) In order to investigate the problems of rice cultivation in salt lands a questionnaire was prepared and circulated to the maritime provinces and states.

13. *Bengal* (*Chinsurah, Bankura and Suri*).—Selection series experiments at Suri Farm comprising two groups of strains in each of four situations were continued with the same layout and treatment as in the two previous years. The results obtained in the two higher situations agreed more or less with the results obtained in the preceding years but those in the lower situations were inconclusive. Semi-final yield trials were continued on fairly large-sized plots. Excepting the performance of one or two strains the results in this case also were inconclusive. Hybridisation studies were continued both at Suri and Chinsurah Farms but no definite result has been obtained.

(*ii*) The pureline and new collection cultural plots at the Bankura Farm were 1,057 as against 1,014 in the previous year.

(*iii*) The scented paddy yield trial at Bankura was continued. *Gandhamalati*, which was sixth in last year's trials, proved the best this year followed by *bansmati* and *randhunipagal* which were the best performers last year.

(*iv*) A complex manurial experiment was started both at Bankura and Chinsurah Farms. The results obtained in the former show that nitrogen in the form of ammonium sulphate is effective in increasing the yield of rice but phosphoric acid did not show similar results. At Chinsurah the highest yield was obtained with *latisail* which was significantly superior to both *patnai* 23 and *bhasamanik*. The improvements in the yield due to the application of 20 lb. and 40 lb. of nitrogen have been found to be significant.

(*v*) Effects of irrigation on yield showed that a considerably higher yield was obtained with ' Irrigation ' and was significantly superior to ' No Irrigation ' treatment.

(*vi*) Correlation studies in rice were also conducted at Chinsurah and it was found that for a given strain of *aman* paddy the yield of grain was significantly associated with weight of straw, tiller, height, spikelet, length of inflorescence, flowering period, flag breadth and flag length ; but when compared between strains, weight of straw, tiller and height were significantly associated with yield. This agrees with the conclusions arrived at last year.

14. *United Provinces (Nagina).*—(*i*) The collection and study of new varieties from abroad and from different parts of India were continued. Preliminary testing of new selections has revealed possibilities for the spread of N.22, N.27, N. 32, Ch.10, A.64 and T.136 in unirrigated tracts in the Eastern Circle of T.22A, T.100 and T.17 in the Rohilkhand and Kumaun Circle, of T.36, in the North-Eastern Circle and of T.43 in pig infested submontane areas. Some more new crosses between T.3 and T.21 and between T.3 and T.43 were effected to evolve heavy yielding and fine quality rices on the one hand and heavy yielding awned fine rices on the other. Two *sathi* hybrids were back crossed with T.12, to increase their yield.

(*ii*) The F_{10} generation of *sathi* crosses again gave hybrids of better yield than the *sathi* parent.

(*iii*) Of the two field scale *sathi* hybrid-trials with six hybrids one was under transplanted conditions and the other under broadcast conditions. The six hybrids in the former trial yielded from 98-175 per cent more than T. 131, but only three hybrids yielded more than the parent in the latter trial, the increase being only 16 per cent.

(*iv*) Compost and ammonium sulphate gave better yield as compared with castor-cake in the qualitative experiment. Molasses experiment for the third year in succession showed that there was no difference between 100 maunds and 200 maunds of molasses, that time of application was insignificant and that there was no interaction between time of application and quantity of molasses applied. Lime experiment also for the third time showed that the effect of lime on the yield of paddy was insignificant. Green manuring gave significantly better yield than no manure, but there was no significant difference between treatments with the whole green manuring plant or only part of it.

(*v*) 50 lb. nitrogen gave significant increases in the yields of the six varieties in the varieties and manure experiment. There was no differential response of varieties to manuring.

(*vi*) Significant differences were obtained due to varieties, manures and irrigation in the manurial and irrigation experiment. In the new irrigation experiment neither the quantity nor the interval of irrigation gave any significant response to the yield.

(*vii*) Yield of paddy after " fallow " and gram was significantly better than after wheat and linseed in the rotation experiment.

(*viii*) A pot experiment on water requirements showed which are the more critical periods in the life of a variety and demonstrated the effect of drought in prolonging the life-cycle of the crop.

15. *Bihar (Sabour).*—(*i*) A number of promising *ghora* paddy selections, possessing medium fine white grains, have been evolved. Preliminary yield tests show some of these to be heavy yielders.

(*ii*) The utility of applying green manures, like *dhaincha* and sunn hemp to the paddy fields is considered to have been fully established. The cost of applying such manures is low and the increase in yield appreciable. Under Bihar conditions, it has resulted in a net extra profit of Rs. 15-20 per acre.

(*iii*) Experiments on the lateral spread of artificial manures show that even in paddy fields—with the usual standing water—there is very little lateral spread and the effect of different manurial treatments could easily be studied by discarding 2-3 border lines on both sides of individual strips. Hence it appears to be feasible to do away with the present costly system of making double bunds.

(*iv*) Investigations on the effect of ' short day ' treatment on the growth and flowering of paddy show that any paddy variety—*aus* or *aman*—could be made to flower within 60 days of sowing, provided necessary ' light ' treatment is given at the proper stage, and that any individual variety could actually be made to flower at any age (beyond 60 days) and at any time of the growing season by giving such ' light ' treatment at an earlier or later stage of growth. Thus a variety normally flowering by the end of October could be made to flower even as early as the end of July.

(*v*) The problem of checking the spread of wild paddy into cultivated fields is to have been successfully solved as a result of hybridization work, and it has been possible to fix a number of hybrid types combining full purple colour of the entire plant with white medium fine grains and high yielding capacity. These hybrid types shall soon be pushed out for being grown in such tracts and its characteristic purple colour would enable the cultivators to rogue out the wild paddies at a very early stage of growth (much before flowering) and thus keep them out forever.

(*vi*) A number of foreign paddies obtained from different parts of India and abroad have now been fully acclimatized and several of them, when put to comparative yield trial, have yielded over 30 per cent higher than the standard varieties of the class. These foreign paddies are also found to possess such desirable characters as earliness, non-lodging character, flood resistance, etc.

(*vii*) Possibility of growing, under Bihar conditions, long-fine *Pulao* rices of U. P. has finally been established, by growing these paddies at Sabour for a number of years without any deterioration in their grain quality.

(*viii*) South-Bihar selections namely, 115BK, 164-17 and 141 in early group, 16BK, 88BK and 250-1 in the medium and 36BK, 76BK and 498-2A in the late group, were tried at a number of departmental farms, under diverse soil and climatic conditions, and have yielded very good results.

(*ix*) About a dozen promising draught resistant selections have also been evolved and a number of them have given fairly high yields in two consecutive years.

(*x*) Investigations on salt tolerance of paddy crop have established the possibility of successfully growing ordinary paddy varieties in saline tracts by simply pretreating their seeds with minute doses of common salt or the seedlings with about 0·10 per cent salt solution.

16. *Cental Provinces and Berar* (*Raipur*).—(*i*) On an average of five years, the variety *ajan* has given an increased yield of about 24 per cent over *gurmatia* which was the standard late variety of the Chattisgarh tract. Similarly the variety *sultugurmatia* has given 23 per cent more yield than the standard medium ripening variety *surmatia*. Strains of uniform quality and improved cropping power have been isolated from most of the selected varieties. Further improvement in the yield of selected strains will be sought by hybridisation which is in progress.

(*ii*) To minimize the loss due to the occurrence of wild rice, Cross Nos. 116 and 19 have been evolved possessing dark purple auricles which distinguish them from wild rice. Yield trials extending over five years have proved that Cross No. 116 is the highest yielding strain in the Central Provinces.

(*iii*) The study of the inheritance of aroma in rice showed that scent behaves as a simple recessive. The inheritance of endosperm characters showed that abdominal white endosperm was dominant to translucent. Spreading habit was found to be dominant to erect in 3 : 1 ratio

(*iv*) Observations on cross pollination in rice showed that natural crossing towards the south, west and south-west, which was the direction of the wind during the flowering period, was the highest, the average percentages within a radius of the first two feet being 2·4, 2·0 and 1·5 respectively.

(*v*) In hulling tests with improved varieties *budhiabako*, *chhatri*, Cross No. 19 and *chinoor* gave good milling results.

(*vi*) Experiments to find out the effect of different quantities of nitrogenous and phosphatic fertilizers applied singly or in different combinations showed that the application of 20 lb. nitrogen and 20 lb. phosphoric acid per acre gave the highest yield which was significantly better than no manure.

(*vii*) Comparison of transplantation and *biasi* (broadcast sowing followed by cross ploughing) under different manurial treatments was also made. It was found that transplantation was significantly better than *biasi*. In transplanted plots the application of 10 lb. nitrogen and 10 lb. phosphoric acid per acre gave the largest net profit.

17. *Assam* (*Habiganj*).—(*i*) The study of variability for some of the quantitative characters in *boro* was taken up. The results show that (*a*) the number of tillers given by *boro* plants is more variable than their height, (*b*) the weight per 1,000 grains in *boro* paddies varies more than their height and less than the number of tillers, given out by them, and (*c*) judged by the standard of flowering duration, different groups of *boro* paddies may be classified as follows :—

Very early.	Early.	Medium.	Late.	Very late.
Kali boro	*Boro*	*Dholi boro and Tupa* (fine grained).	*Tupa* (coarse grained) and *rata*	Bashful and *Pankait*

In submergence studies it has been found that for two and four week old seedlings there is an association between the height of the plants at the time of submergence and their growth rate below water and this association becomes less marked with every increase in the depth of submergence.

(*ii*) Hybridization work in order to obtain a fine-grained spring paddy which would combine the better grain quality of *aus* with the hardiness and high yield of *boro* is in progress.

(*iii*) Varietal trials conducted during the year showed that *aman* types 129, 49-2, 249, 268, 48-14, 29-1, 51-5-5, 185 and 133 were high yielders. This confirms the result obtained during the last two years.

(*iv*) Cultural experiments have yielded the following results :—

(*a*) The presence of sufficient moisture in the soil at the time of sowing and sufficient interval (preferably six weeks) between the sowing and the advent of flood are indispensable qualifications for the best time of *aman* sowing.

(*b*) A seed rate of 75-90 lb. per acre is best for dry sowing in *aman*. The optimum dose for wet sowing is 75 lb. per acre.

(*c*) A good crop of *aman* can be expected if the sowing can be done before the second week of May.

(*d*) Under no circumstances should *boro* transplantation be carried beyond 11th January.

(*e*) It is profitable to give two weedings to the *boro* crop after the transplantation. The extra yield due to weeding more than pays its cost.

(*f*) Early broadcasting in *boro* is as good as transplantation.

(*g*) The best seed-rate for the seed bed of *boro* is 560 lb. per acre.

18. *Orissa* (*Cuttack, Berhampur* and *Jeypore*).—(*i*) As a result of the trials at Cuttack, the following types have been found to be better yielding than the standard types in the different groups :—

(*a*) *Laghu* or autumn paddies—Type 116 A.

(*b*) Early *aman.—Dahia* series types 677, 672 and 601—13.

(*c*) Mid *aman* (Coarse group).—Type 885.

(Fine group) —Type 412.

(*d*) Late *aman.*—Type 165 ; also types 90 and 147.

(*ii*) Types 608, 812 and 90 are fine paddies possessing superior milling qualities. These have been selected for distribution in mill areas and other export centres. It was found that type 608 was early, 812 was medium and 90 late in maturity. Type 812 has been multiplied and widely distributed. Type 90 gave significantly higher yields at Cuttack and Berhampur against the standard late variety. Type 608 gave best yields in the early fine group.

(*iii*) Flood resistance trials showed that type 13 A gave the best performance. It is proposed to multiply this type for wider distribution.

(*iv*) A large number of types from autumn and early winter paddies were tried as *dalua* (summer paddy). Type 112, which is an early variety and yields good quality rice, seemed to be specially useful.

(*v*) Manurial experiments showed that 45 lb. of nitrogen from *dhaincha* gave the best yield at Cuttack. Both at this centre and at Berhampur 45 lb. nitrogen applied as ammonium sulphate gave better yield than the same quantity applied in the form of mustard cake.

(*vi*) At Berhampur the average yield from the area under improved strains rose from 2,020 lb. per acre in 1938-39 to 2,450 lb. per acre in 1939-40. Hybridization trials showed that Hybrid 11 was superior in quality and equal in yield to Berhampur 1, the best yielding strain of *boropanko*.

(*vii*) 28,434 lb. of improved seeds were distributed during the year as against 11,507 in 1938-39.

(*viii*) In row tests and preliminary trials at Jeypore 15 out of the 63 promising cultures under trial gave 10 per cent or more yield over the general mean. Work on the isolation of suitable strains of paddy for cultivation on hill slopes was taken up. It was also found that broadcasting seed at 100 lb. an acre and transplanting 6 in. apart was useful for early paddy on poor soils.

(*ix*) Physiological studies were also conducted and some interesting anatomical peculiarities observed in the stem of *Oryza coarctata.* Anaerobic treatment in germinal stages seemed to induce tolerance to submergence in latter stages of plant growth. Diurnal rate of transpiration in flood-resistant paddies has been observed to be lower than the ordinary paddies. Plants raised from seed receiving intermittent soaking and drying treatment seem to stand drought conditions better. Juice extracted from germinating grains help in breaking dormancy partially and plants raised from these treated seeds appear to be more vigorous.

19. *Other schemes.*—Work under the new schemes sanctioned in Kashmir, Travancore and Baroda was initiated during the year. Their progress will be reviewed in subsequent reports.

B. Wheat and Barley

20. *Cereal rusts.*—This scheme which was due to terminate on the 30th September 1940 was extended up to the 31st March 1943.

(*i*) Inoculation experiments were carried out on some of the less common species of *Berberis* and *Thalictrum.*

(*ii*) Further evidence has been obtained regarding the-over-summering of rusts in the hills.

(*iii*) 206 rust collections were analysed for the study of physiologic races. No new race was however found.

(*iv*) Pure cultures of all the physiologic races found so far were maintained in the laboratory at Simla. Some of the cultures have completed 142 generations.

(*v*) Data obtained from the study of a large number of wind trajectories have been tabulated and scrutinised but curves for some of the stations are still under preparation.

(*vi*) A large number of tests were carried out for the study of seedling and adult resistance for the Economic Botanists in the provinces and states as well as for work in connection with the breeding of resistant varieties by the Imperial Economic Botanist.

(*vii*) A survey of rusts was carried out in co-operation with the officers at Lyallpur, Poona, Coimbatore and Nagpur.

(*viii*) A monograph dealing with the Study of Physiologic races, Role of Alternate Hosts and Over-summering in relation to annual recurrence of Rusts, conducted up to March 1938 has already been published. Another monograph dealing with Dissemination in relation to initial Outbreaks and Control of Epidemics by Direct Means is under preparation.

21. *Breeding of rust resistant wheats.*—(*i*) Fifty-six varieties were added to the collection of hill wheats, bringing the total number to 132. Classification was undertaken in the first 40 varieties which are now fixed. The rest were still under study.

(*ii*) Three of the best hill wheats were put in preliminary yield trials for testing their yields against some of the standard varieties from the plains and one foreign variety ; all the three did well.

(*iii*) The nine crosses selected previously for intensive study regarding rust resistance were in the F_5 generation this year. In addition to the tests for seedling resistance of these crosses, adult resistance tests were also carried out in the field. In the seedling tests, out of a total of 2,794 plants tested, 1,694 proved resistant and in the adult resistance tests, 967 out of 1,708.

(*iv*) The anatomical and morphological study of the varieties selected for the purpose last year has given rather encouraging results and is being continued.

22. *The malting and brewing qualities of barleys.*—(*i*) Samples from the 1939 crop were sent to the Imperial Agricultural Research Institute, New Delhi, for a preliminary test to find out the most promising samples to be sent to the Institute of Brewing, London, for a final test. Of the 118 samples from the 1939 crop sent to the Imperial Agricultural Research Institute 16 were selected for the final test at the Institute of Brewing.

(*ii*) Variety C 251 was found to be very good and most of the samples of this variety were placed in Grade 1. These barleys showed the ' quality ' for which some brewers have been willing to pay a premium. Two other samples of C 251 and a *desi* variety were placed in Grade 2. Two other *desi* varieties

and varieties A 50 and J 63 were placed in Grade 3. Of these Grade 1 was comparable with Choice Californian and those in Grades 2 and 3 were equal to Medium Californian or Sample Chilian.

23. *Other schemes.*—Work under the new schemes sanctioned in respect of (*i*) testing wheat for black rusts in South India and (*ii*) the appointment of e real technologist was started during the year. Their progress will be reviewed in subsequent reports along with the report on the wheat milling and baking tests carried out at Lyallpur.

C.—Millets and Pulses

24. *Striga attack on* jowar.—(*i*) The Bilichigan variety of *jowar* has given some strains showing cent per cent resistance to *S. lutea.*

(*ii*) A temperature of 35°C and a moisture level of 20 per cent. of the oven-dry weight of river soil induced the maximum attack of *S. lutea.*

(*iii*) Field experiments on the resistance of selected strains to different species of Striga by cross inoculation showed that a majority of the strains for trial proved resistant to both *S. lutea* and *S. densiflora.*

(*iv*) Field observations have disclosed that the *kharif* season was more favourable for Striga attack than the *rabi* season, under the climatic conditions prevailing during the year, that the extent of the attack was not correlated in any way with the type of the Striga nor was it correlated with the type of *jowar.* It is, however, possible that the extent of attack of Striga depends upon the virulence of the seed of Striga which may vary with the place of origin and the degree of susceptibility of the variety of *jowar.* It may also vary with the stage of maturity of the seed and its germination percentage.

(*v*) Experiments have also shown that there is no antagonism between different Striga species and more than one species will attack the plant at the same time if the variety of *jowar* is susceptible to it.

(*vi*) Pot experiments showed that there was a definite reduction in the height of host due to attack of Striga as also a reduction in yield, some *jowar* plants being completely killed. On the other hand some plants escaped attack. The amount of damage varied from plant to plant and with the earliness or lateness of attack.

(*vii*) Experiments with South African varieties showed that almost all the strains obtained from that country were susceptible to both *S. lutea* and *S. densiflora* and hence cannot be used for breeding resistant strains.

25. *Research on pulses.*—(*i*) A co-ordinated programme of research based on the information furnished by the provinces and states was prepared which provides for work on all aspects and a copy was sent to all provinces and states for information and guidance.

(*ii*) On the plant breeding side the work will consist of the collection of the existing types of the important pulses as a basis for selection and hybridization. Selection will be made for the following qualities :—

(*a*) Higher yield.

(*b*) Resistance to diseases and pests.

(*c*) Different times of maturity (both early and late types are desirable in some places).

(*d*) Special qualities such as production of pods for use as vegetables, fodder production rather than grain or in addition to grain, adaptation to certain special conditions of soil or climate.

Each province or state will work with the varieties of pulses suited to its own agricultural economy.

(*iii*) As regards botanical classification, it will be necessary in time to devise a schedule for the description of pulses on the same lines as has been done in the case of cotton, rice or wheat. In due time the provinces and states should describe their finally selected types on the lines of this schedule. Meanwhile, no work need be undertaken on classification but if necessary a study of flower biology, in so far as it is required for practical plant breeding, might be undertaken.

(*iv*) Genetical work, *viz.* the listing of plant characters and study of their inheritance should be done only at the Imperial Agricultural Research Institute, by the Millet Specialist, Coimbatore, and by the Crop Botanist, Bombay.

(*v*) In respect of agricultural problems such as: (*a*) Experimentation with different mixtures of cereals and pulses and also with mixtures of pulses themselves, (*b*) effect of one crop on the other both as regards quantity and quality; (*c*) effect of the pulses on the soils both as regards its physical effect and the effect on the nitrogen content of the soil, (*d*) utilization of certain pulses for green manuring; (*e*) co-ordinated work on soybean, it is proposed that actual field experiments should be done in all provinces and states but the chemical work concerned with the nitrogen content of the soil and the protein content of the cereal should be confined only to such centres as have well equipped agricultural chemistry sections.

(*vi*) On the entomological side it is proposed that life-histories of pests might be studied at universities which have the necessary staff and equipment. Remedial treatments and breed studies should be done by the Agricultural Departments and the Imperial Agricultural Research Institute.

(*vii*) Pathological work to be undertaken at the Imperial Agricultural Research Institute, in the Punjab and at Poona.

(*viii*) The Council has sanctioned two schemes on pulses—one in Bombay and the other in Sind. Work on both these is expected to start in 1941-42. Other schemes on pulses are also under consideration.

D. Oilseeds

26. *Groundnuts* (*Madras*).—(*i*) Sixteen crosses for economic purposes and three for inheritance studies were made.

(*ii*) Trials for the study of the effect of climate and soil variations on the quality of groundnuts were conducted; yields and quality of the produce were seen to be primarily governed by the rainfall and its distribution; the nature of the soil coming into prominence only when it is defective or in excess.

(*iii*) In manurial experiments, the application of K and P gave significant increase in yields.

(*iv*) Varieties and type collection was maintained and their qualitative estimations made.

27. *Linseed* (*Bengal*).—(*i*) The effect of early and late sowings was studied. The result did not confirm the previous year's finding that early sowings gave better yields. It was observed at Dacca Farm that late sowings gave better results but at Berhampore the results supported the view that earlier sowings were better than late sowings. The analytical results did not indicate any perceptible difference in first and second sowings though there was marked difference in third sowings. The percentage of oil and iodine was almost identical

in the case of the first and second sowings but in the third sowings the iodine value fell with the percentage of oil.

(*ii*) So far as the analytical results were concerned, PH 6 was considered the most satisfactory sample. It is however still premature to conclude anything from the results of the work done in 1939-40.

28. *Linseed and other oilseeds* (*Central Provinces and Berar*).—(*i*) Ninety-seven strains of linseed which bred true for various economic characters were selected and oil percentages determined for 26 of these. A number of hand machines were made and tried in the extraction of fibre from linseed straw by the dry scutching process and preliminary experiments were conducted for finding out the different uses of the fibre.

(*ii*) 200 strains of sesamum were isolated, which have desirable characters. Monofactorial segregations were observed in the progenies of natural hybrids. Acclimatisation of the Burma varieties was continued. Five of these promise well from which further selections have been made.

(*iii*) Thirty-six strains of safflower were isolated and oil percentages determined for twenty-five strains. Two Cawnpore vatieties T. 39 and T. 59 were tried for the first time and appear promising.

(*iv*) Observations were made on the progenies representing thirteen different cultures of niger raised from the selfed seeds of single plant selections. The plants raised from selfed seeds exhibited great deterioration in vigour. At a later stage they were completely damaged by insects, yielding no seeds.

29. *Brassical oilseeds* (*Punjab*).—(*i*) The method of crossing selected plants by means of artificially bred bees under insect-proof cages is considered to hold out promise of success.

(*ii*) Forty-seven unit-species of yellow *sarson* and *raya* have been evolved. In the yield test arranged with 20 early maturing, self-fertile hybrids which have recently become available the yields of eight have satisfactorily been at par with that of *toria* selection A, a strain which has already been proved to be superior to the local unselected strains of *toria*.

(*iii*) The mode of inheritance of several morphological characters, such as seed colour, flower colour, number of valves per pod etc., was studied.

(*iv*) The manurial trial on *toria* has furnished results of great practical utility. The highest significant increase in yield over the unmanured plots resulted from the application of ammonium sulphate.

(*v*) The results of the chemical investigations carried out on *toria* and *sarson* have shown that the acid value of oils of these crops increases considerably as a result of storage over long periods.

(*vi*) In certain types of yellow *sarson* the percentage of oil is as high as 51·73 as against about 45 per cent in the case of both *toria* and the brown seeded *sarson*.

(*vii*) A number of promising new hybrids and types combining high yield of seed with high oil content have now become available.

30. *Castor seed* (*Hyderabad*).—This scheme was extended for another five years, *i.e.* upto 31st March 1944.

(*i*) An intensive plant-to-plant study of 132 single-plant cultures was carried out. Laboratory studies and oil analysis data furnished a basis for further selection and elimination.

(*ii*) A simple manurial trial with the three treatments, *viz.* castor-cake, farm yard manure and no manure as the control, showed that the significant superiority of castor-cake over the ' control ' was 83·23 per cent and that of farm yard manure 62·05 per cent. There was no significant difference between these two manures.

(*iii*) Germination was found to be much hastened by soaking the seed in water for 12 hours.

(*iv*) Observations have shown that early planting is the best for obtaining a fair crop.

31. *Coconuts* (*Madras*).—(*i*) Nuts obtained by natural, self and cross pollination from all the trees in the six yield-groups were harvested for raising seedlings for a comparative study. Copra and oil content of nuts, number and rate of production of leaves and output of female flowers of individual trees were recorded.

(*ii*) Pollination work for securing nuts for the study of the progenies of selfed trees was completed.

(*iii*) Harvest of selfed and naturally pollinated nuts from the " early poor " and " early heavy " bearing palms for a comparative study of the respective seedlings was completed.

(*iv*) The out-turn of coir fibre from husks of 10 months old nuts was significantly lower than that from the 9, 11 and 12 months old nuts. The higher age groups gave deeper coloured fibre. The length of individual fibres was the same (16·2 cm.) for all age groups except in the 12 months, which gave the shortest fibre (15·2 cm.). There was no difference in the thickness of fibre from husks of different ages.

(*v*) The quality of copra from 9 and 10 months old nuts was again found to be decidedly inferior to that from 11 and 12 months old nuts. The percentage of nuts spoilt on storage was also greater in these two younger age groups. The copra content was seen to increase on storage in the 9 and 10 months old nuts but in spite of this the final yield of copra was appreciably less than that of the 11 and 12 months old nuts.

(*vi*) The determinations of oil content of copra from 9, 10, 11 and 12 months old nuts gave results in conformity with those reported last time. The percentage of oil was found to be maximum when the nuts were 9 to 10 months old and decreased slightly when they reached 12 months. There was also a significant increase in oil due to storage of the 9 and 10 months old nuts. The higher percentages of oil at harvest and on storage of these groups, however, did not compensate for their lower yield of copra. The 11 and 12 months old nuts gave decidedly higher yield of copra and consequently larger quantity of oil per nut than the 9 and 10 months old nuts. The free fatty acid content was also seen to increase markedly when the 9 and 10 months old nuts were stored and converted into copra.

32. *Coconuts* (*Travancore*).—(*i*) Seven hundred and ten isolations were made from roots of infected trees and three hundred and nineteen leaf isolations, as also one hundred and thirty-two soil isolations.

(*ii*) Inoculation experiments were conducted with the organisms isolated, on healthy tender leaves and on spore suspensions of fungi on healthy trees in the open and under field conditions. It was observed that the severity of infection was very high during the monsoon periods. The coconut Helminthosporium was found to be the most virulent parasite.

(*iii*) Soils from representative coconut areas in Travancore and Cochin were collected and analysed for major constituents like N, P_2O, K_2O and CaO. The results obtained confirmed the opinion previously expressed regarding the low nutritional condition of the coconut soils of Travancore and Cochin. Some definite correlation appears to exist between soil conditions and disease incidence. Correcting such conditions thus appears to be a fruitful line of attacking the problem.

33. *Propaganda for cotton seed cake.*—(*i*) During the two years 1938-39 and 1939-40, seventy-three samples of cotton seeds were collected from ten different provinces and seven states and examined for moisture, husk, kernel and oil contents. In addition to these samples, fifteen semi-large-scale trials were made on actual crushing of cotton seeds obtained from these provinces in order to arrive at the actual cost of treating these seeds. The results showed that about 68 per cent of the varieties produced in the country could be economically pressed for the production of oil and decorticated cake. The oil on being refined gave good quality edible oil while the cake was found to be an excellent feeding cake for dairy cattle.

(*ii*) The following quantities of decorticated cake were supplied under the scheme during the years 1937-38 to 1939-40 to the agricultural departments for propaganda purposes :—

1937-38	534 mds.
1938-39	214 „
1939-40	168 „

In 1939-40 the losses were heavy as samples for crushing trials were obtained from the different provinces and states on the large scale and extra expenditure on railway freight had to be incurred.

(*iii*) Cotton seed crushing is now gaining ground in India. It has been reported that about a dozen mills in the Punjab had started crushing undecorticated cotton seed since the scheme was started. It is also reported that one big mill has started at Hyderabad (Sind) with complete decortication plant and refinery having a capacity for treating 4000 mds. of cotton seed per day.

E. Tobacco

34. *Tobacco Sub-station, Guntur.*—(*i*) A study of the effect of various manures or combinations of these on the quality of cigarette tobacco leaf showed that N improves yield and plant characters like height, number of curable leaves, etc. Particularly in combination with P or K, it accelerates maturity. P gave good colour to the leaf, but some of the combinations of N and P gave the best results.

(*ii*) Leaf from lands subject to periodical inundation gave the best colour of leaf, but the retention of colour was very poor. The light black soils produce leaf of very good colour. Reddish black soils gave leaf of poor body and colour.

(*iii*) A study of the effect of rotation crops showed that plant characters seem to develop best in tobacco after maize. The best yield was obtained from plots following *Panicu meliaceum* while maturity and colour of leaf were best after Sorghum.

(*iv*) Monanza, a recent introduction from America, appears to be as good as Harrison's Special.

(*v*) Experiments on acclimatisation showed that so far as morphological characters are concerned there was no deterioration.

(*vi*) Experiments with a number of varieties showed that the time required for each stage in curing varies with the different varieties and the flue-curing technique has to be varied to suit the requirements of each variety. The manurial treatments affect the response to curing temperatures.

35. *Co-operative flue-curing.*—This scheme was closed down in 1938-39. The final report of the Imperial Economic Botanist was received.

(*i*) During the first year of the scheme (1935-36) only a few samples were received by the Imperial Economic Botanist and some of them were sun-cured instead of flue-cured. In most of the provinces construction of barns could not be finished in time to flue-cure the crop. The results were therefore incomplete and inconclusive. In the second year eleven stations grew the three tobacco varieties and sent samples to the Imperial Economic Botanist. The results showed that in some centres while the yield was good the quality was poor and unsuitable for cigarette manufacture; and at other centres while the quality was good the yield was poor. No comment could be made on the proportion of the three principal grades recognized because of the unavoidable differences in grading. In the next year the results showed that except in two centres, Harrison's Special gave the highest yield. As regards quality the leaf from Warangal was the best. In the final year (1938-39) samples were received from only ten stations, the experiment at Mandalay (Burma) having been discontinued.

(*ii*) The data of all the years furnish an indication that high grade tobacco suitable for cigarette manufacture can be produced at Nadiad, Jullundur, Sabour, Bilaspur and Warangal. As regards quality no appreciable differences were found between the three varieties tested in any of the years. But definite conclusions cannot be drawn unless the methods of flue-curing and grading are standardized.

36. *Training of Tobacco Officers.*—Two officers, one each from Bombay and Bihar, had been selected by the respective Governments for training in the United States of America. They were expected to proceed to America early in 1941. But, owing to the international situation, it was decided to postpone sending these two officers to America till later.

F. Fruit

37. *Horticultural Conference.*—The second conference of horticultural research workers in India was held under the auspices of the Council in November 1940. The position in this respect is as follows :—

(*i*) Notes regarding the general position of fruit research work in the various provinces and states in India were placed before the Conference but detailed discussion was confined to mango, orange, apple, pineapple and papaya. Systems of orchard management based on valid experiments, subsidiary problems of root-stock, variety, treatment of pests and diseases, propagation methods and survey were dealt with in the course of the discussions. In the case of papaya the problems of sex determination and selection were also reviewed.

(*ii*) The Conference recommended that :—

(*a*) A recommendation should be sent up to the Government of India for the appointment of an Imperial Horticulturist.

(*b*) Methods of judging important fruits including the use of score cards should be included in the agenda of the next horticultural research workers' conference.

(*c*) A tentative schedule of characters on mangoes should be drawn up by the Agricultural Commissioner.

(*d*) Illustrated articles of a popular nature on horticultural subjects should be published in *Indian Farming*.

(*e*) Provinces and states should be requested to permit their research workers to visit research stations in other provinces and states.

38. *Horticultural Station, Kodur (Madras).*—(*i*) A series of root-stock trials with sweet orange and acid lime scion varieties were under study, and although the final results from these have to be awaited for some years, it has been found from the data and observations collected up to the first 18 months of orchard life, that *jamberi* (rough lemon) is the most vigorous root-stock both for sweet orange and acid lime scion varieties. *Gajanimma* produces equally vigorous sweet orange trees in the pre-bearing orchard stage but it is extremely susceptible to gummosis. For sweet oranges, *kichili* and limes form the second most vigorous group of root-stocks with *billikichili*, grapefruit, sour orange and *santra* coming next in importance, and sweet orange and *pomelo* root-stocks and unworked sweet orange seedlings producing the smallest size plants. Lime root-stock has shown itself to produce the smallest sized lime scion trees.

(*ii*) From a separate trial, it has been ascertained that the differences in tree vigour observed between different grades of *kichili* and *jamberi* root-stocks prior to planting tend to level out within 18 months of planting. A rigid selection of seedlings in citrus seed and nursery beds for producing vigorous scion trees appears, therefore, to be a futile practice.

(*iii*) Root studies on a large number of unworked seedlings and budded sweet orange plants have revealed that some changes in orchard cultural practices are desirable. Contrary to the popular belief, the citrus roots are found to forage far beyond the drip of leaves and therefore application of water and manures within the area covered by the tree top is clearly inadequate. These root studies have also been helpful in indicating the optimum spacing for orange trees on different root-stocks.

(*iv*) With the Nakamura method of side-grafting, it was found possible to raise successfully some mango grafts with scion wood obtained from long distances and inserted three to five days after separation from the parent trees.

(*v*) A cheap machine for grading Kodur *chinee* oranges costing about Rs. 70 was devised at Kodur with the help of a grant from the Agricultural Marketing Adviser to the Government of India. This machine has been found to grade 3,500 to 4,750 fruits per hour into four grades.

(*vi*) Sibmating in papayas was undertaken so as to eliminate the less desirable trees which appear in large numbers as individual segregates and to fix the parental charactors. Plants of six papaya strains of the fourth generation of inbred lines kindly sent by an agricultural scientist in South Africa have been planted.

39. *Horticultural, Station, Krishnagar, Bengal.*—(*i*) Different varieties of mangoes showed different amounts of growth. The variety Safdar Pasand which flowered last year did not flower this year. The budding of mangoes was taken up in two different seasons but failed.

(*ii*) The South African variety of papaya was found to be the best. But the crop was badly damaged by the heavy rains.

(*iii*) Among citrus fruits, *maltas* flowered and set fruits very well but all the fruits dropped down on account of continuous rains. Moreover there were attacks by fungi and fruit flies. *Santras* flowered and set fruits. Also seedless Kagzi limes maintained their high standard and fruited all the year round. Sweet lime was a definite success. Budded Kagzi lemon plants from Poona succumbed to citrus canker.

(*iv*) Benares, Allahabad and Harijha guavas may be said to have succeeded in Bengal. Seedless varieties were poor in yield and are therefore not successful as a commercial variety. The pruning of branches did not succeed in giving higher yields.

(*v*) Queen proved to be the best variety of pineapples. Attempts to propagate it by discs and longitudinal sections of stems of fruited plants failed.

(*vi*) Varietal trials of bananas failed owing to heavy rains. Tentatively it can be said that for comparatively coarser varieties acclimatised suckers and for finer varieties new suckers are to be preferred for planting. As regards manuring it was found that compost alone gave the best results.

(*vii*) The main tomato crop did best. In this variety imported seeds gave higher yield than acclimatised ones.

40. *Horticultural Station, Chaubattia, U. P.*—For propagation September budding was found to be the best while grafting in March with the use of grafting wax was found to be as good as September budding. An experiment has been laid out to attempt renovation of an old orchard by two different methods, namely planting trees in between existing ones and removing old trees altogether. In the experiment of frame working of fruit trees the common method of 'top-working' was compared with the improved method of "frame working" and the experiment indicates that the latter is a better method. Manurial trials on apple were laid out on newly acquired forest land and a combined pruning and mulching experiment is also in progress. Observations on electroculture experiments indicate that the treatments do not produce any difference either in the growth of trees or in their cropping propensities. The obnoxious weed '*siroo*' (*Imperata Cylindrica*) has been controlled by sodium chlorate sprays.

(*ii*) The system of genetic soil classification has been adopted and soil profiles have now been classified into genetic groups keeping structural characters as variants. Further elucidation of horizon characteristics have been obtained by the analyses of clay fractions and determination of the nature of exchangeable complex. The *p*H values of 497 samples were determined. Work on the composting of pine needles is in progress.

(*iii*) Control measures for the apple root borer were tried and paradichlorobenzine was found to be effective up to 3" depth for use as a soil fumigant. The resistance to the attack of woolly aphis by certain varieties of stocks was studied. Experiments on the control of woolly aphis on parts of apple trees above the ground have yielded valuable results. Observations on the life histories and status of other fruit pests and their parasites were continued and control measures tried.

(*iv*) A survey of the major diseases of apples, pear, peach, apricot, cherry and plum was continued. The collar or root-rot of apples was further studied. The following diseases were also studied and control measures tried:—

Stem-black, pink, hairy root, leaf spot, sooty blotch and fly speck and storage diseases.

A leaf curl disease of the wild cherry caused by *Taphrina* sp. was recorded for the first time in India at the Station. The control of *lichens* on apple trees is in progress.

41. *Horticultural Station, Montgomery, Punjab.*—(*i*) A list of synonyms of different varieties of citrus root-stocks has been prepared with a view to standardise nomenclature.

(*ii*) Local *malta*, local *santra*, and grape fruit have shown more vigorous growth on *Kharna Khatta* than on any other root-stocks. On the other hand it appears that blood-red *maltas* should not be propagated on *Kharna Khatta* root-stock. Some root-stocks appear to cause a dwarfing effect on certain varieties of citrus, whilst other varieties grow vigorously on them.

(*iii*) *Galgal* and *Jullunduri Khatti* appear to be poor producers of tap root; *galgal* and *mitha* appear to have a marked tendency to produce longer lateral roots; *galgal* produces by far the largest number of fibrous lateral roots as compared with the remaining varieties.

(*iv*) In regard to grape vine hybridization, seedlings raised have been planted in the field for study and further crosses have been made.

(*v*) Wilting of young citrus seedlings occurring at 30°-31°C can be controlled by the application of 1 per cent formaldehyde solution at the rate of half a litre per square foot. A mixture made up of Bordeaux mixture (3 : 3 : 50) and Rosin compound (2 : 1 : 1) gave encouraging results in the case of anthracnose on grape vines on spraying once in the middle of April and again in the first week of June.

42. *Horticultural Station, Sabour, Bihar.*—(*i*) It is considered that the mango tree is by nature an alternate bearer and that very often due to climatic and other environmental factors instead of giving a crop every second year some types do not give a crop or yield very little harvest for two or three successive years. The management of orchards also has a great deal to do with the regular cropping of mango trees. It is however too early to draw definite conclusions.

(*ii*) At least three ploughings a year should be given to a mango orchard for maintenance of healthy conditions. Otherwise the condition of the trees deteriorates. In order to give a good shape to the tree ultimately it is necessary to give a well thought out pruning to young plants in a new orchard.

(*iii*) Two U. P. varieties of mango—*Aman Dasheri* and *Taimuria* have shown good promise for introduction in the province of Bihar.

(*iv*) Work on budding of mango has yielded promising results. Side grafting of the mangoes has also been successful. Ordinary method of grafting mango by inarching has been improved.

(*v*) Improvements have been introduced in the preparation of *gooties* for the propagation of *litchis*. Using synthetic plant hormones it has been possible to root *litchi* cuttings in the ordinary way.

(*vi*) Controlled production of papaya seeds by artificial pollination has been established to be a practical method for reducing variation with a variety and the ratio of male to female or hermaphrodite plants. Planting three

seedlings in one position (or hole) and finally thinning to one plant is a satisfactory method for ensuring the maximum number of productive plants in a plot.

43. *Horticultural Station, Burnihat, Assam.*—(*i*) Thirty-nine new specimens of fruits and 66 specimens of flowers have been collected during the year. Thirty-nine cultures of the current year and 111 cultures of the last year are now in the nursery. Four thousand seedlings of oranges have been raised in the station. The performances of mother trees from which the seeds were obtained have now been recorded for two consecutive years and out of them 5 trees have been finally selected for bud-wood.

(*ii*) Five different indigenous stocks have been raised from seeds for stock trial experiment. The seedlings will be fit for budding next year.

(*iii*) Some exotic nursery plants have been obtained from the departmental orchard at Khanapara and planted in the station. They will be budded on different indigenous stocks and the behaviour of the budded plants will be studied.

(*iv*) Five different kinds of stocks obtained from different provinces are under trial in the field. Stocks obtained from Madras are doing well and those from Bombay and the Punjab are not thriving well. All of them are expected to be fit for budding by next year.

(*v*) In Manurial ' Block A ', the yield of each individual tree, including the guard rows, has been recorded. Due to protracted drought at the time of flowering the yield has come down considerably. There is also marked variation in yield from tree to tree. For Manurial ' Block B ' seedlings have been raised from seeds collected from a single, heavy yielding tree in Shella, the foremost orange tract in the province.

(*vi*) In cultural experiments the yield of each individual tree has been recorded and will be recorded again next year.

(*vii*) Citrus leaf miners, lemon caterpillars and termite attacked the seedlings in the nursery. Citrus trunk borers attacked some adult plants in the bearing orange grove. Except leaf miners, all the other pests were controlled successfully.

(*viii*) The yellowing disease usually occurs under two extreme sets of conditions, *viz.* where the plantation is carried too high on the hill slopes or where it is dragged far too low in the valley. Twenty-five affected plants obtained from Khanapara were planted in a well-drained field in the citrus station. In the course of 8 weeks all the mottled leaves have changed into deep green.

44. *Horticultural Station, Tarnab, N.-W. F. P.*—The work was started on the 21st October 1938.

(*i*) The yield records of different treatments of the peach experiments did not give statistically significant results probably due to the late application of manures.

(*ii*) Under plums, pears and grapes new varieties are being introduced from California, Quetta and other places.

(*iii*) The work on insect pests and fungus disease control is being done in co-operation with the provincial Mycologist and the Entomologist.

45. *Horticultural Station, Sambalpur, Orissa.*—The work was started on 14 November 1939.

(*i*) Pits for the trials of (1) root-stocks and (2) exotic varieties were kept ready for planting during the monsoon. Five kinds of root-stocks from Madras,

Punjab and Bombay have been collected, which are to be budded *in situ* with Nagpur *santra*. Their height measurements were taken in the nursery. For the variety collection plot, 40 different kinds of citrus varieties have been collected, mostly from the various provinces.

(*ii*) Records of yield and height and spread measurements of individual trees of the existing orchard of Sambalpur Farm, on which the N P K trial is being made, were taken. The variability in yield was great. The N P and K fertilizers, singly and in various combinations were applied at the break of monsoon. Half the dose of N was also applied in the last week of February after the flowering was over. In all cases both experimental and guard row trees were manured.

(*iii*) Records of individual trees regarding flowering, productivity, vigour and susceptibility to pests and diseases are being taken.

(*iv*) The irrigation experiment, giving water by ring and furrow methods was begun in the month of January. The application of organic manures to this experiment had to be postponed owing to the difficulty of obtaining fish manure. Instead groundnut cake and farmyard manure have been applied at the break of the monsoon. These manures in future will be used in the month of March after the flowering is over.

46. *Horticultural Station, Hyderabad.*—Work was only started early in 1941.

47. *Horticultural Station, Hessarghatta, Mysore.*—(*i*) Pineapple, papaya, fig and guava plants began to yield fruits which were readily sold.

(*ii*) With apple trees stock trials, varietal trials, combined manurial and irrigation experiments, mycological and entomological experiments were carried out accoring to the approved programme.

(*iii*) An additional experiment was included to study the annual development of the root system of the Rome Beauty apple.

(*iv*) A monthly budding experiment was started in the plant nursery to get preliminary knowledge of the best time for budding and the difference between inserting buds ' with wood ' and ' without wood '.

48. *Orange cultivation (Coorg).*—A compact scheme of modest dimension for the improvement of the cultivation and the marketing of the Coorg orange was sanctioned. The scheme is designed to investigate and deal with problems relating to the manuring, cultivation, pruning and treatment of insect pests and fungus diseases of oranges, and also with their marketing.

49. *Mango necrosis (black tip), Lucknow.*—The Council sanctioned a scheme for investigations on the necrosis or black tip disease of the mango. Research will be conducted at the Lucknow University under the guidance of Dr. S. N. Das Gupta. This disease is popularly believed to be due to the fumes emanating from brick-kilns in the vicinity of orchards. The lines of investigation proposed in the scheme are (*i*) survey, (*ii*) soil studies, (*iii*) effect of combustion fumes and (*iv*) study of pathological histology. The scheme is expected to be initiated shortly.

50. *San Jose scale survey, Kashmir.*—The scheme was started in August 1939.

(*i*) The San José scale is wide-spread in the valley of Kashmir and in several other parts of the state. The field survey indicated that the incidence of the scale was directly proportional to the humidity of the place. Twenty different kinds of host plants of the scale were recorded. Grown up trees of

apricot, cherry and almonds were found to be generally free from infestation, while their seedlings were susceptible. Infestation was specially severe in the case of foreign varieties of apples and in pears. It was also found that badly infested fruit plants had hardly any living scale on them a year after their planting at Jammu (1,000') and it appeared that some climatic factor worked as a lethal agent.

(*ii*) Comparative tests with insecticides proved that Diesel oil emulsion of 1 : 5 dilution was most effective. Dilutions 1 : 7 and 1 : 10 also gave good results. "Whiz" emulsion of 1 : 24 dilution and lime-sulphur of 1 : 8 dilution were found to be nearly as good as Diesel oil of 1 : 10 dilution. Local soft soap was as efficacious in making the emulsion as resin-fish oil soap.

(*iii*) As regards woolly aphis, the apple varieties Sweet Cider and Northern Spy have been found to be immune, while the two local varieties, *Shandgundu* and *Phokhla* have showed themselves to be highly resistant. Control experiments indicate lime-sulphur and tobacco-decoction to be economical and efficacious. A flame gun has not proved effective.

51. *Cold storage, Bombay.*—Cold storage experiments were conducted on oranges from Nagpur; bananas from Bassein, pears from Kashmir and on mangoes, figs, papayas, limes and tomatoes.

(*ii*) Nagpur oranges were found to store well at a temperature of 40°F. for three months but if they have to be sent after this period to distant markets they require to be distributed in refrigerated railway wagons; otherwise the juice gives a slightly fermented odour. Pears from Kashmir kept well for four months at 32°F. Ripe figs were stored in a sound condition for about a month at 32°F. and 35°F. while limes remained sound at a temperature of 52°F. and developed a good colour within a month.

(*iii*) Experimental work on the gas storage of different fruits has now commenced.

52. *Cold storage, Punjab.*—(*i*) Four varieties of *malta* orange, namely, Valencia Late, Common, Blood Red, and Seville were successfully stored at 36-39°F in excellent marketable condition for 4½, 4, 3 and 3 months, respectively. Large sized fruit kept better as compared to the small sized fruit. Wrapping with butter-paper was found to be beneficial. The fruit, after removal from the cold storage kept in good condition for about 4 days at 80-90°F.

(*ii*) Local and Pathankot, loose skinned *sangtras*, kept well only for five and four weeks, respectively, at 36-39°F.

(*iii*) Triumph variety of grapefruit kept in good condition for about 5½ months at 36-39°F. Marsh seedless variety tried for one season only kept in marketable condition for 3¼ months at 36-39°F after which the fruit developed '*chill spots*'.

(*iv*) The fruit of *Langra* mango of A-stage of maturity (hard, green, mature, crisp and flesh white) and B-stage of maturity (fruit firm, flesh, yellowish white 'a stage before eating ripeness') kept best at 45°F for 5 and 4 weeks, respectively. Wrapping was beneficial and borax dip (5 per cent) slightly reduced wastage. The fruit stored at 45°F after removal from cold storage, ripened normally at 90-100°F, within four days.

(*v*) Hard, yellowish-green, mature fruit of Bartlett or Williams' pear kept best at 32°F for 4½ months. Wrapping and borax dip (5 per cent) had adverse effect on the keeping quality of the fruit. The fruit stored at 32°F. after removal from cold storage ripened within 5 days at 60-70°F.

(*vi*) Kishmish and Haitha grapes packed in sawdust kept in marketable condition for 40 and 50 days respectively at 32°F. These varieties when packed in dry grass kept in good condition for 20 and 30 days respectively at 32°F.

53. *Fruit and vegetable preservation, Punjab.*—(*i*) Experimental work has been carried out on the following subjects :—

(*a*) Citrus products like squashes, and candied peel,

(*b*) Citrus by-products like citric acid and pectin,

(*c*) Summer fruit juices, *e.g. falsa* juice, grape juice,

(*d*) Mango products such as mango squash, dried mango juice and canned mangoes,

(*e*) Other products and items :—
Colour changes in tomato juice, changes in food value of the juice during manufacturing, etc.

(*ii*) Methods of manufacturing orange and lemon squashes previously evolved under the scheme were given a semi-commercial trial in the juice and squash manufacturing room which has been recently equipped with an up-to-date and modern plant by the Punjab Government. Certain products prepared according to the method standardised in the scheme were prepared for despatch to England for opinion but owing to the outbreak of war this idea had to be abandoned. The samples have, however, been tested from time to time and have been found to keep their quality during storage.

54. *Fruit and vegetable drying, N.-W. F. P.*—A new scheme was sanctioned for improving the quality of the dried fruit and vegetable products now being turned out in the N.-W. F. P. on a small scale :—

(*i*) Work will be carried out on the drying of fruits both in the sun and by dehydration and the products obtained by both methods compared.

(*ii*) Other problems that will be tackled are the determination of suitable varieties of peaches, plums and apricots for drying, evolution of standard methods, analysis of the products for moisture content, estimation of the costs of production and devising of methods of packing.

(*iii*) In the case of vegetables, *viz.* potatoes, peas, sweet-corn, carrots turnips, cabbage and cauliflower, it is intended to try the method of dehydration.

55. *Fruit canning, Quetta.*—(*i*) The following varieties were found suitable for canning :—

Apricots.—Charmagz and Large Red.

Plums.—Quetta Gage.

Peaches.—Philip's Cling, Sims and Palora.

Cherries.—White Heart, Red and Black.

Grapes.—Haitha.

(*ii*) Preservation by making juices and syrups, jams and jellies, drying of fruits, manufacture of candied and crystallized products were also studied.

(*iii*) A recipe for preparing chutney from apricots and water melon rind has been standardised.

(*iv*) A white dry wine has been prepared from Kishmish grapes using champagne yeast for selective fermentation.

(*v*) Other problems studied included a preliminary bio-chemical investigation of the ripening changes in two important varieties of grapes, and the determination of ascorbic acid content of certain fruits and vegetables and their products.

56. *Testing of canned fruits and vegetables, Punjab.*—(*i*) The Council had had under consideration the question of establishing in India an All-India Fruit and Vegetable Preservation Station somewhat on the lines of the Fruit and Vegetable Preservation Station at Campden in England. The Advisory Board felt that such a station in India would be most useful not only for carrying out research work but also for giving technical advice to provinces and states which had already interested themselves in such work and for stimulating the production of a sufficient quantity of fruits and vegetables of standardised types which is the essential pre-requisite of a successful canning and bottling industry in any country. In view, however, of the fact that the demand of the Defence Services for canned fruits and vegetables was large and urgent it was decided that steps should be taken forthwith to deal with problems of immediate importance in connection with the requirements of the Defence Services, in cooperation with the Supply Department—the details for the establishment of an all-India station with regional stations being worked out separately.

(*ii*) The Council has accordingly sanctioned a scheme of research which is for a period of one year in the first instance. This scheme provides for the appointment of a Fruit Bio-Chemist and a Microbiologist with the required technical and clerical staff at Lyallpur, under the administrative control of the Department of Agriculture, Punjab, which has kindly agreed to give all necessary facilities. The Supply Department on their part have agreed to provide the services of a Canning Expert and a Foodstuffs Inspector with headquarters at Delhi. The duties allotted to Lyallpur are :—

(*a*) To analyse samples supplied by the Supply Department, report on these and advise as to what is needed to bring them up to army requirements.

(*b*) To undertake research if necessary.

(*c*) To train staff for employment in approved factories, if necessary.

(*d*) To ascertain the types and quantities of different types of fruits required for canning.

(*e*) To undertake semi-commercial trials of formula and processes at the instance of the Supply Department or otherwise.

(*f*) To advise the Supply Department regarding the manufacturing cost of the products with a view to fixing a reasonable price.

(*iii*) Work along these lines was begun from the 1st June 1941.

G.—Vegetables

57. *Potato breeding* (*Imperial Agricultural Research Institute*).—(*i*) From the collection of *desi* and European varieties cultivated in India, after elimination of duplicates, 26 distinct varieties were studied in detail and botanical descriptions recorded for them.

(*ii*) The results of identification of varieties sent to Dr. R. N. Salaman, Chairman, Potato Synonym Committee of the National Institute of Agricultural Botany show that the number of varieties cultivated in India is small

and that most of them are old European varieties. Of 141 samples of *desi* and European varieties, only eight were found to be important commercially.

(*iii*) The study of the new material received as a result of the Empire Potato Expedition to South America was continued. Two new species were found and several unknown ones.

(*iv*) Special studies on photoperiodism, early blight, frost and virus resistance were continued.

(*v*) For the production of varieties with desirable characters, both inter-specific and inter-varietal hybridization was continued.

(*vi*) Two hundred and fifty-six varieties from the Indian and exotic collection were tested for resistance to early blight. The results showed that severe infection under artificial conditions can be brought about and that varieties differ in their capacity to withstand the infection.

(*vii*) Experiments for evolving frost resistant varieties were conducted. No conclusive results were obtained as the degree of severity of frost could not be controlled under natural conditions.

(*viii*) A survey of the most important virus diseases has shown that four diseases are most important in the plains as well as in the hills. Grafting experiments have been started with a view to test the susceptibility and resistance of various species.

(*ix*) Eighty-nine hybrids have been selected for a final yield test.

(*x*) The study of fertility and sterility showed that in potatoes sterility may result from (1) non-flowering, (2) degeneration of male or female organs or both, (3) hybridity, and (4) incompatability.

(*xi*) The study of dormancy and storage was continued at Delhi. In the storage study an endeavour is being made to find varietal differences in keeping quality.

(*xii*) Cooking tests on a number of varieties were also carried out.

H.—Fibres

58. *Sunn hemp (Madras).*—(*i*) The diurnal sunn hemp moth caterpillar (*Utethesia Pulchella*) appeared in abnormal numbers and in spite of all remedial measures, devasted the varietal plots completely and the seed-rate trial partly, so much so that resowing had to be done.

(*ii*) Subsequently the monsoons were uneven and excessive which spoiled the crop resulting in wilt and consequent poor quality and quantity of fibre.

(*iii*) On the whole the season was most adverse and the growth yields unsatisfactory.

59. *Sunn hemp (Bihar).*—This scheme started in January 1938. But as the assistant who was carrying out the work left in October 1939 and the services of the Assistant Economic Botanist who organised the work were dispensed with a little later, the scheme has been held in abeyance since November 1939. It will be resumed as soon as adequate arrangements for its supervision can be made.

60. *Sunn hemp (Central Provinces and Berar).*—(*i*) Mass selection and single plant selection were continued. A varietal trial with five varieties showed that there was no significant difference in the yields of dry stalk amongst all the five. Correlation study between the height of stem and yield of fibre and between diameter of stem and yield of fibre has shown that there exists a high correlation between diameter of stem and yield of fibre.

(*ii*) Work on the effect of seed-rate, time of sowing and harvesting on yield showed that a seed-rate of 80 to 100 lb. per acre gave higher yields than those obtained from lower seed-rates.

(*iii*) Interaction between dates of sowing and stages of harvest was found to be significant and the results showed that the earliest sown crop when harvested at the second or third stage of cutting gave significantly higher yields than those obtained when the crop was harvested at the first stage of cutting.

(*iv*) It was observed that retting is quicker in standing water than in running water and fibres obtained by retting in cold weather were better in colour than those obtained by retting in hot weather.

(*v*) The germination percentage of the seeds obtained from the crop harvested was 85 per cent when the pods were quite mature and 94 per cent when they were dead ripe.

61. *Flax (Bengal).*—(*i*) The experiments on flax during the year were conducted with acclimatised seeds of both " J. W. S." and " Liral Monarch ".

(*ii*) The manurial experiments showed that to ensure a good crop some chemical fertilizer in addition to cow dung or green manure is necessary.

(*iii*) Experiments were conducted to improve flax extraction methods. Seventeen breaking machines and seventeen scutching machines were made during the year. The breaking machine being slow in action will have to be further remodelled to increase its efficiency. It is considered that ultimately the retting and extraction work will have to be done in a central place with power machineries leaving only the growing of the crop to the cultivators.

I.—Miscellaneous Crops

62. *Medicinal plants (Colonel Chopra).*—(*i*) The numerous plants with alleged medicinal properties, met with in the survey have been put under four categories :—(*a*) Medicinal plants used in the western pharmacopoeias and their substitutes growing in India. (*b*) Plants used in the western medicine and recognised in extra-pharmacopoeias. (*c*) Important plants used in indigenous medicine. (*d*) Plants with alleged medicinal properties. The first and second groups contain many drugs which are being imported and their supply depends upon the course of the war. These, therefore, require immediate attention. Considerable data have been collected during the last five years from the various herbaria, from the literature, as also by personal visits to different parts of India. The detailed distribution of medicinal plants growing in India is now being worked out and will be published by instalments. This procedure will help in facilitating the supply of crude vegetable drugs from Indian sources, and will stimulate the cultivation of medicinal plants.

(*ii*) Samples of *Hyoscyamus niger* cultivated in the Punjab showed 0·55 and 0·59 per cent of the total alkaloids, the British Pharmacopoeia limit being 0·5 per cent. Three samples of *Chrysanthemum cinerariifolium* (pyrethrum) from plants cultivated in Murree and Kashmir showed 1·30, 1·03 and 0·741 per cent of pyrethrins respectively. The chemical and biological tests of various samples of the flower heads of pyrethrum during this and previous years have shown that *C. cinerariifolium* cultivated in the hills of Northern India compares favourably with the foreign grown commodity which is imported. The cultivation of this plant, therefore, should be extended at a rapid rate. On the other hand, *Chrysanthemum coccineum* Willd. (*C. roseum* Bieb.) has failed to give promising results and is poor in quality as compared with *C. cinerariifolium*. Its cultivation is not recommended.

(*iii*) The herbarium now comprises about 1,650 species or about 6,500 specimens.

(*iv*) Further progress has been made in connection with the collection of data for the "Glossary of Medicinal Plants" and it will now be possible to expedite this work. The progress of this work, however, depends upon the progress which is made in the survey and collection of herbarium specimens.

(*v*) The following poisonous and medicinal plants were analysed and the physiological action of their active principles was studied in close co-operation with the staff of the School of Tropical Medicine, Calcutta, and of the Indigenous Drugs Enquiry of the Indian Research Fund Association :—*Argemone maxicana* Linn, *Skimmia laureola* Sieb. & Zace. ex Walp., *Curcuma longa* Roxb., *Cleistanthus collinus* Benth. & Hook, *Lochnera rosea* (Linn.) Reichb. (*Vinca rosea* Linn.), *Cassytha filiformis* Linn., *Sphaeranthus indicus* Linn., *Ephedra gerardiana* Wall., *Chrysanthemum cinerariifolium* Vis., *C. coccineum* Willd., *Hyosyamus niger* Linn.

(*vi*) Testing of the toxicity of plants by tissue culture method was continued.

63. *Drug plants.*—The Council sanctioned a sum of Rs. 5,000 for urgent work to find out the possibility of growing certain medicinal plants which were ordinarily imported from abroad and the supply of which has become restricted owing to the war. The progress of the scheme will be dealt with in subsequent reports.

64. Pan *cultivation* (*Central Provinces and Berar*).—This scheme has been started recently (May 1940) to study the causes of *pan* diseases and to evolve remedial measures. It provides for work on foot-rot and anthracnose diseases in particular, manurial treatments and a study of the fungi which cause the diseases. *Pan* from other provinces will also be grown and studied.

65. *Cardamom cultivation.*—(*i*) In December 1939 an *ad hoc* Cardamoms Sub-Committee recomended that a survey of cardamom cultivation should be undertaken as soon as possible; and that the officer conducting the survey should outline a scheme for co-ordinated research which would include a central station and sub-stations in the important areas. These recommendations were accepted by the Council and the work was entrusted to Mr. W. W. Mayne, Coffee Scientific Officer of the United Planters' Association of Southern India.

(*ii*) Mr. Mayne submitted his report. His main recommendations which are under examination in consultation with the Governments concerned are that :—

(*a*) An experiment station for cardamoms should be established in the Anamallai Hills, with two sub-stations, one in the Cardamom Hills of Travancore and the other in the Munzerabad Taluk of the Mysore State.

(*b*) The programme of research should be based on selection and breeding work, with special reference to the multiplication of types resistant to thrips attack.

(*c*) The scheme should be under the control of a small representative committee, rather than under one administration, perhaps on the lines of the tea, rubber and coconut research schemes in Ceylon.

66. *Cinchona cultivation.*—(*i*) The Council felt that in view of the large cost involved, it would not be possible to undertake research work on cinchona

without special financial help from Government. A reference was accordingly made to the Government of India on the subject.

(*ii*) As the Government of Bengal had a scheme of work on cinchona under contemplation, it was considered that the scheme originally put up would need revision in the light of the Bengal scheme. The matter is under consideration.

I.—Soil Science

67. *Soil problems* (*Bengal*).—This scheme was extended up to the 30th June 1942.

(*i*) Dynamometric studies were made of the resistance offered to the passage of a cultivation implement through the soil. The soil moisture being the most important factor in determining the Draw Bar Pull, and empirical relation between the soil moisture and the resistance was suggested. The effect of different manures on the resistance has also been studied.

(*ii*) Further studies on the absorption of water by the soil have been made with a view to see the behaviour of the evaporation curves at a high vapour pressure.

68. *Coastal soils* (*Calcutta University*).—(*i*) The investigations were confined to the pan soils of the Bakarganj district. An intensive survey and examination of soils chosen from four localities was carried out.

(*ii*) At a depth of 6 in. to 9 in. below the surface soils, a hard layer had been known to occur extensively. Eight soil profiles were examined at Barisal and six at Bhola. The Barisal *chars* are characterized by the occurrence of a hard layer generally at a depth not exceeding 2 ft. The more recent of the Bhola *chars* examined so far do not appear to contain such pans. The thickness of the pan layer as judged from profile examinations varies from one foot to three feet. The pan layer has been found in some cases to be associated with the accumulation of clay and dimunition of pore space. The pan layer impedes downward percolation of the surface water and also upward rise of the water table.

(*iii*) Besides mechanical analyses, soil samples were subjected to chemical analyses for HCl and Na_2CO_3, soluble constituents, carbonate, moisture loss on ignition, base exchange capacity and exchangeable bases, and on the results of this analysis the Barisal profiles have been tentatively classified into three groups.

69. *Colloid soil constituents* (*Calcutta University*).—(*i*) The chemical composition of a number of sub-fractions of hydrogen clays obtained from non-lateritic calcareous soil, acid soil and bentonite soil, was studied and was found to vary with the size of the particles. In the majority of cases the base exchange capacity calculated from the titration curves has been found to increase as the size of the particle diminishes. The potentiometric titration curves with NaOH of hydrogen clays and hydrogen bentonites obtained from the entire clay fraction of the above two soils and the two bentonites used this year, as also of a dozen other soils used during the previous years, have been found to be of two different types. The titration curves of the first type resemble those of a dibasic acid with an initial strong acid character. The curves of the other type resemble those of a weak monobasic acid.

(*ii*) The base exchange capacity of the different soils on treatment according to various methods for the removal of free inorganic oxides was studied.

Similarly observations have been made on the specific conductivity, Al displacement, free and total acids and exchangeable hydrogen in respect of different soils.

(*iii*) The base exchange capacities of four soils and of their clay, silt, sand, gravel, and organic matter have been determined.

(*iv*) It was observed that the specific conductivity of colloidal solutions of clays salts, *i.e.* clays saturated with different cations, and the cataphoretic speed of the particles do not vary linearly with the concentration.

(*v*) The refractive indices of air dried and oven dried samples of eleven hydrogen clays and seven hydrogen bentonites have been measured. With one exception, the oven dried sample was found to have a higher refractive index than the air dried sample.

(*vi*) Preliminary mineralogical examination of eighteen Indian soils and one Burma soil shows that among heavy minerals tourmaline and epidote are of frequent occurrence. Muscovite has been found only in one clay pan soil from Sakrand. Felspar is found to be the most dominant lighter mineral and is found in all except two soils.

70. *Nitrogen loss and nitrogen fixation in soils* (*Dr. Dhar, Allahabad*).—This has now terminated.

(*i*) Nitrogen fixation takes place on the addition of *neem* cake in the presence of sunlight.

(*ii*) Maximum rise in nitrogen content takes place in the course of two months.

(*iii*) Nitrogen fixation takes place on the addition of molasses to the soil.

(*iv*) Nitrogen fixation takes place on the addition of cellulosic substances like hay.

(*v*) Total carbon of the exposed soils is always less than that of the covered ones.

(*vi*) The loss of total nitrogen is more in the case of ammonium sulphate than in the case of *neem* cake when applied to the fields, although in the beginning the total quantity of nitrogen was the same in both cases.

(*vii*) Nitrification and nitrogen loss are more in light than in darkness.

71. *All-India soil survey.*—(*i*) The Council approved a two years scheme for carrying out work preliminary to a soil survey, *i.e.* to ascertain what data exist at present in regard to soils and to collect and collate the same and to find out where there are gaps and determine what steps should be taken to fill them up. The aims and advantages of a soil survey are set forth below and may be of interest.

(*ii*) The crop plant lives in two environments, the air and the soil. The soil anchors the plant and provides it with water and important elements of plant food. Practical experience from the beginning of time has shown that soils differ markedly in the way they will grow crops. It is only, however, since the soil came to be studied for itself that any light has been thrown on the causes of these differences. Such fundamental study of the soil has shown it to be an amazingly complex thing, and some of the most recent and most recondite parts of soil science have explained crop failures and have been the basis of land reclamation.

(*iii*) The identifying and mapping of soils in the field according to some kind of system has been the aim of soil scientists in all countries. In India

also there has been done in many provinces and states a great deal of such work. Such surveys have dealt with limited areas and have generally had a limited objective, such as, for example, to determine whether a soil in a new area is fit for irrigation, or the recent survey of soils on which cinchona grows to determine the relationship between soil composition and the success or failure of cinchona.

(*iv*) An all-India survey would be above both limitations of area and of objective. With so much scattered work done all over India it seems highly desirable to fill in the gaps and get a complete soil map just as one has a complete geological map, and it is both science and commonsense to require that such a survey should be done in a uniform and fundamental manner. A survey based on the principles of soil classification recently developed in Russia (the so-called genetic system) which considers the soil as a whole and also takes account of the processes which have formed it, appears the best and most comprehensive for this purpose, and hence has been recommended by the Special Sub-Committee dealing with this subject, and also by the Advisory Board. Given a basic body of knowledge like this, the responses of each class of soil to management and of crops to each class of soil can be investigated (in many cases forecasted) and results made comparable throughout India.

(*v*) The Soil Survey Division of the Department of Agriculture in America has for some years been engaged in the mapping of the soils of that country. These maps are accompanied by accurate descriptions from field notes and many laboratory analyses. Recently tables showing how these soils are regarded from the point of view of productivity have been worked out. These soil maps are, in America, regarded as essential to every agency interested in land use, and can be used to give the individual farmer sound information to supplement his own experience in planning farm management practices.

72. *Scheme for the preparation of cheap synthetic manure from town refuse and other waste materials.*—(*i*) By conducting large-scale compost trials with municipal wastes (town refuse and night soils), green weeds, fallen leaves. waste straw, grass and *jowar* stubble, it was found that the Hot Fermentation System is more efficient than the Mysore Method of Composting in respect of hygienic factors, quality of manure recovered and chemical composition of manure. The quality of manure obtained by this method was 1½ times better than by the latter. Pot trials carried out with the hot fermented manure on *ragi*, *jowar*, rice, field beans, tomato and lucerne showed that the compost possessed a high manurial value. The yield of manure and conseravtion of nitrogen ranged from 70 to 80 per cent in the hot fermentaion system whereas they ranged from 40 to 50 per cent when the material was composted aerobically.

(*ii*) The experiments also indicated that losses of nitrogen and organic matter during composting could be satisfactorily controlled by mixing the refuse materials, layer by layer, with garden earth.

(*iii*) The experiment on the rates of nitrification of composts prepared from different types of refuse materials and by different systems of composting, showed that composts prepared by the hot fermentation method nitrified as well aerobically prepared composts and that those prepared from night soil nitrified more easily and to a greater extent than composts prepared from dung and urine by treatment with farm refuse.

73. *Other schemes.*—In respect of other schemes, *viz* :

(*i*) Lateritic and red soils, Dacca,

(*ii*) Organic constituents of soils, Calcutta,

(*iii*) Sub-surface investigations, Sind, and

(*iv*) Water requirements of crops, Punjab,

the position is that the two latter have only been started recently, while reports for the year 1939-40 for the two former were dealt with in last year's report, and the reports for 1940-41 have not yet been received.

K.—Agronomy

74. *Dry farming, Madras.*—(*i*) The effectiveness of different cultural treatments in the conservation of rain water was found to depend largely on the initial moisture content of the soil and the distribution of rainfall. Effect of interculturing on the moisture conservation showed that the plots receiving higher number of intercultures contained a higher moisture at harvest time. No definite conclusion could be drawn with regard to the optimum number of intercultures to be given.

(*ii*) There is a general similarity in the fluctuation of nitrate nitrogen and that of soil moisture, accumulation of nitrates taking place during the rainy period. Interculturing has not been found to increase nitrification. Variations in total nitrogen during crop growth were small.

(*iii*) *Bunding* the land in a sloping field has been found to give a slight accumulation of silt at the lower end. Chemical analysis of samples taken from plots under Improved Dry Farming method did not show any variation in the different constituents with treatments like ' bunding and ploughing'.

(*iv*) High doses of farmyard manure like 6,000 lb. clearly promote the development of roots but there is not much to choose between these two doses. Farmyard manure and compost promote the growth of *Setaria*, the effect of manure being felt at all stages in the life of the plant. The manured plants were earlier and a considerable economy of water was in evidence.

(*v*) *Bunding* and fallowing were found beneficial to plant growth.

(*vi*) By digging trenches on either side of a cotton row and allowing the moist soil to dry out and harden, it has been possible to induce the development of the hard layer which causes constriction of the tap-root and the other abnormalities noticed in the affected roots in the field in dry years.

(*vii*) Crop mixture studies showed that a mixture of sorghum and Bengal gram was not desirable as there was severe competition among the roots of both the crops at every stage of growth. Cotton has been found to afford no protection to the soil against soil erosion at any stage of its growth. A pure crop of *Setaria*, however, very effectively protected the soil. Due to its spreading habit a pure crop of groundnut also afforded almost complete protection to the soil.

75. *Dry farming, Bombay.*—(*i*) Soil moisture determinations at Sholapur showed that the moisture was restricted only to the surface 9″ layer and the same was inadequate for *rabi* crop production. The failure of grain-formation was entirely due to deficiency of soil moisture. At Bijapur, on the other hand, soil moistures were adequate throughout the whole season.

(*ii*) Chemical analysis of the manured and the unmanured soils of Sholapur showed an increase in the nitrogen contents but no change in other plant food ingredients like potash and phosphoric acid. Carbon-nitrogen ratio was found to have decreased in the case of medium deep soil but had remained constant in the light shallow soil after five years' of manurial additions.

(*iii*) There was some further increase in depth of the murum disintegration plots. The general area of the farm with this type of soil also showed some increase. There was not much loss of rain water by run-off or much loss of soil by erosion at Sholapur on account of shortage of rain. At Bijapur, 3·61 inches of rainfall and 9·44 tons of soil per acre were lost during the year.

(*iv*) The loss of soil moisture by evaporation from uncropped plots with 12" soil layer was nearly equal to the total rainfall received at Sholapur.

(*v*) The wilting coefficient of *jowar* plants on light shallow soil of Sholapur was determined at two different stages, *viz.* six weeks stage and the earhead emergence stage. The values found were 12·14 and 14·03 for the two stages respectively. The water-requirement of the *jowar* plant was determined at two different seasons, *viz. kharif* and *rabi*, and it was found that it was much higher during the *kharif* (373) than during the *rabi* (282). Again the water requirement in three different soils, *viz.* 2 from Bijapur and 1 from Sholapur was determined.

The values showed no significant differences and varied between 282 to 329.

(*vi*) At Sholapur, *rabi jowar* failed as a grain crop and gave only straw which was 2/3rd of that obtained in a good season. At Bijapur the Bombay Dry Farming method gave an average yield of 654 lb. of *jowar* grain and 938 lb. of *jowar* straw per acre over an area of nearly 18 acres. The yield by the cultivators' method was 302 lb. of grain and 463 lb. of straw.

(*vii*) The cotton crop which was tried for the first time under the dry farming method in rotation gave an average yield of 365 lb. of seed cotton per acre against only 191 lb. per acre by the local cultivators' method.

76. *Dry farming, Punjab.*—(*i*) Soil conservation trials made on fields of *bajra* did not show any advantage of deep cultivation on the yield of grain or straw. The eradication of weeds and the formation of soil mulch helped in the conservation of moisture. Artificial *mulchas* of *bajra* stalks and cotton sticks were more effective. Fallow enables the soil moisture to be carried over from one year to the other. Harrow cultivation after deep ploughing was as effective as cultivation with the *desi* plough.

(*ii*) Fallowing has no particular effect on the germination of wheat and gram. There was better germination of gram in fields ploughed deep. Germination was also better in plots cultivated with the *desi* plough and *sohaga* than in those where a spring-toothed harrow and *sohaga* were used. Gram and wheat could be sown up to the middle of October without loss of germination.

(*iii*) Farmyard manure added in 1938 at 5, 10 and 15 tons per acre did not show any significant difference on the yield of grain of *bajra* or *jowar* in 1939. But the yields of straw were significantly higher.

(*iv*) Crops grown on fallow land have been found to contain more nitrogen, potassium and phosphorus. Fallow plots contained less organic matter than cropped plots. The yields obtained after fallow were better than those after *guara* crop. *Guara* after fallow gave 560 lb. and after *bajra* 376 lb. per acre.

(*v*) There was a decrease of total nitrogen in soil after harvesting of *bajra*, but during the growth of the crop it fluctuated. Nitrates showed a decrease with the growth of the crop. A higher nitrate content gave a higher yield of *bajra*.

(*vi*) In spite of scanty rainfall the local small grained variety of *bajra* gave an average yield of 403 lb. as against 236 lb. of medium grained type per acre. *Bajra* sown after cotton was a failure. *Jowar* is not so suitable as *bajra* for exceptionally dry conditions.

(*vii*) Of all the *kharif* crops, cotton has proved the most successful. It was sown after a rainfall of about 4 inches received in February-March. An yield of about 6½ maunds of seed cotton per acre was obtained from each of two varieties of *Gossypium indicum* var. Mollisoni. *Guara* is another promising crop for drought conditions. The local early maturing type of *bajri* gives a higher yield than the improved variety A 1/3 under dry conditions.

(*viii*) In fallow plots there was an increase of 78 tons of water per acre due to rains and it represents about 11 per cent of the total rain water received. *Bajra* gets its moisture from 3-5 feet depth of soil, while *guara*, wheat and cotton go to the six-foot layer. Fallowing and manuring enable plants to draw moisture from deeper layers.

(*ix*) Of the four varieties of *bajra*, the small-grained local variety had the deepest root system and greatest spreading habit. The roots of sweet *jowars*, J. S. 21 and J. S. 100, penetrated deeper than non-sweet *jowars*, J. S. 20 and *duggi*.

(*x*) The results of the previous years on the water requirements of crops were confirmed. *Bajra* transpired less than *jowar*. Gram transpired less than wheat. Soil drought during the vegetative period or at the time of maturity was more harmful to wheat type 8-A than to 9-D.

(*xi*) Farmyard manure promoted vegetative growth without proportional increase of dry matter.

(*xii*) The wilting co-efficient varied more with the soil than with the crop and the stage of its growth.

77. *Dry farming, Hyderabad.*—(*i*) Varietal trials with *Setaria* showed that variety K. 92 gave significantly higher yields than the rest. In *jowar* varieties B. S. 34, M.35-1, M.47-3 and N. D. 8 were the best in order of merit.

(*ii*) The effect of fallow experiments with *rabi jowar* was to increase the yield by 131·5 per cent over the continuously cropped plots.

(*iii*) The application of improved dry farming methods gave an increase of 17·4 per cent of grain in *jowar* and 69 per cent of seed-cotton in the case of cotton.

(*iv*) Both in the *kharif* and *rabi* plots ' *bunding* and mulching ' showed uniformly almost the highest moisture content. Field scale and *bunding* trials proved consistently superior to no *bunding* as well as to scooping.

(*v*) In manurial *cum* varietal trials, compost proved ineffective while oil cake gave an increase of 14·6% seed cotton.

L.—Physiology

78. *Plant physiology* (*Mr. Boshi Sen*).—(*i*) A satisfactory technique for the stimulation necessary for increase of permeability of the cells of germinating embryo of wheat has been evolved.

(*ii*) The maximum earliness observed in vernalised mustard plants was in type C 9. The optimum conditions for vernalisation of split seeds have been found. Unsplit vernalised seeds can be dried and stored for over 17 months without any loss of the effect induced by pre-chilling. None of the Indian wheats tried gave any response to vernalisation, whereas Holdfast, Yeoman,

Juliana and Yorkwin (foreign types) responded. In linseed P 12 gave the maximum earliness but the problem involved in the distribution of unsplit vernalised seeds cannot be solved without prolonged research work. Further work on this has, therefore, been stopped. Sweet pea gave excellent responses and earliness of over 60 days has been observed.

(*iii*) A new line of work has been taken up by crossing Pusa 4 which did not respond to vernalisation, with Holdfast and Yeoman. F_1 generation showed intermediate characters both as regards the vegetative period and the number of tillers. F_2 generation has also been planted for segregation. The effect of vernalisation of the hybrid is being investigated.

79. *Physiology of cane and wheat* (*Benares Hindu University*).—(*i*) In the case of sugarcane, sulphate of ammonia alone increased the yield, assimilation, chlorophyll, respiration, height and tillering. Sulphate of potash increased sucrose and purity. Superphosphate increased only chlorophyll. The optimum quantity of fertilisers was found to be 150 lb. N, 75 lb. P_2O_5 and 25 lb. K_2O per acre. The best time of application was : NP at germination, and K two months after germination, for yield, sucrose and purity. The best form of inorganic nitrogenous fertilisers was : sulphate of ammonia for yield and niciphos for sucrose and purity.

(*ii*) In the case of wheat sulphate of ammonia produced a general response in all characters studied except length of ear. Superphosphate increased grain, straw, chlorophyll, respiration and tillering but had no effect on other characters such as assimilation, number and size of leaves, length of ear and protein. Sulphate of potash increased only grain, straw, assimilation and tillering but had no effect on other characters. Compost increased both grain and straw. The optimum quantity of fertilisers was found to be : 60 lb. N, 40 lb. P_2O_5 and 30 lb. K_2O. The best time of application was in two instalments, half at germination and the other half a month later. The most suitable forms for the application of nitrogen are fish-guano and niciphos for both grain and protein. The optimum *p*H value is 5·0-6·5 ; and the optimum soil moisture 35 per cent (expressed on percentage water-holding-capacity basis).

80. *Nutrition of the rice plant* (*Dacca University*).—(*i*) Previous observations that the fixation of nitrogen in soil by algae is considerably stimulated in the presence of a rice crop, specially on the addition of some inorganic fertilisers to the soil, have been confirmed.

(*ii*) Even in the absence of drainage, the amount of dissolved oxygen is greater in the presence of algae. This holds for both cropped and uncropped soils.

(*iii*) Pot culture experiments showed that the yield and the composition of the crop are not appreciably affected as a result of an abundant growth of algae in the soil.

M.—Entomology

81. *Entomological survey* (*Punjab and N.-W. F. P.*).—This scheme has now been completed.

(*i*) San Jose scale has been found in a number of districts in the Punjab and the North-West Frontier Province. Alder, almond, apple, apricot, chestnut, cherry, peach, pear, plum and various other food plants were found to have been attacked. Studies in the life-history of the pest show that its nymphs produced on an infested fruit can crawl up to a distance of 12 feet on the ground to infest a plant. The yellow billed magpie, jungle-crow, house-crow, myna and other Passerine birds and a bat have been found to act as carriers of the nymphs.

(*ii*) California red scale (*Aonidiella aurantii* Musk) has been found to a very widely distributed pest of citrus in the Punjab and the North-West Frontier Province. It has also been found on *jaman* and rose. The leaves infested with it turn yellow and the fruits become spotted and unmarketable.

(*iii*) Mango hoppers were collected practically from every locality in which the mango is grown and everywhere they have been found to be a major pest.

(*iv*) The citrus *Psyl'a* (*Diaphorina citri* Ku) and citrus white-fly (*Dialeurodes citri* Ashmead) have also been found to be widely distributed in North-west India and in all localities of their occurrence they inflict serious losses on citrus growers.

(*v*) Wooly aphis is present in the Simla Hills and in the Kulu and Kurram vallyes. Its parasite *Aphelinus mali* Hald., introduced in the Punjab in 1936, is now well established in the various orchards in the Kulu valley and the Simla Hills.

(*vi*) Peach curl aphis (*Brachycaudus pruni* Koch) (*Rhynchota*) has been found to be one of the most destructive pests brought to light during this survery.

(*vii*) *Apriona cinerea* Chev. (*Coleoptera*) has also been found to be destructive to apples.

(*viii*) Of the bettle pests of fruit trees *Mimastra cyanure* Hope appears to have a restricted distribution in both the provinces. It has been found to skeletonize the leaves of peach, pear, almond, mulberry, plum, apricot, fig and pomegranate.

(*ix*) The Codling moth is one of the most important Lepidopterous pests of fruit trees and is also the most destructive. It has been found that the young caterpillars may enter the fruit at any point although most of them do so through the calyx or its vicinity.

(*x*) Eleven species of fruit fly have been recorded of which the *ferrugineus* species in the North-West Frontier Province and *zonatus* and *myiopardalis* in the Punjab are most destructive.

(*xi*) It appears that the San Jose scale usually spreads through nursery stock which may be obtained locally, from outside the province or from foreign countries. Apple fruits coming from Kashmir were found infested to the extent of 30%. There may be as many as 1,988 living insects on a single fruit. Most of them are alive when the fruit reaches its destination. The Codling moth was found on apples imported from Kabul. It was also found on apples exported from the Kurram Valley to other parts of India. Dry fruits imported into this country were also found to have been infested with these pests.

82. *The Gangai pest.*—This scheme has now terminated.

(*i*) *Pachydiplosis oryzae* Mani responsible for the *gangai* or silvery shoot diseases of rice, lays eggs on paddy leaf blades. The maggot or larva makes its way to the growing point which it destroys and a gall is produced in place of the stem bearing earhead. The life-history of the fly has been worked out.

(*ii*) Regarding the seasonal history of the pest, the alternative host plants when the paddy crop is not in the fields could not be definitely settled though there are reasons to believe that *Cynodon dactylon* or *dub* may be an alternative host plant. Various grasses showed galls in them from which *Cecidomyids* emerged but their species were different. This point therefore still remains obscure.

(*iii*) The incidence of the pest depends upon the variety of rice grown, time and methods of sowing, condition of the soil (water-logged or otherwise). Growing of early, local varieties by transplantation method at a period earlier than the normal time is one of the best ways of avoiding serious damage by the pest. The use of fertilizers to stimulate plant growth is a contributory factor towards minimising damage.

(*iv*) *Pachydiplosis oryzae* are phototropic and advantage of this habit can be taken for the control of the pest by systematic setting up of light traps as soon as silvery shoots appear.

(*v*) Three parasites, two *Chalcidoids* and one *Platygaster* sp. were bred from the tubes of paddy and *dub*. These operate as a natural check on the pest. The possibilities of all or some of these parasites being bred artificially on a mass scale and their liberation in fields is a point that deserves investigation.

N.—Pathology

83. *Virus diseases* (*Bombay*).—(*i*) The first visible symptom of the yellow vein mosaic disease of *bhindi* (*Hibiscus esculentus* L.) was the clearing of small veins and then of larger veins. In young leaves these patterns were sharply delineated. In badly diseased plants no marked mosaic but only a general chlorosis was found to develop in young leaves. All growth subsequent to infection was dwarfed. Infected plants blossomed sparingly and produced few fruits. It has also been found that the virus is not sap-transmissible but is transmitted by grafting. No indication of the transmission of the disease by seed has been found.

(*ii*) Observations made have indicated that *bhindi* plants are subject to infestation by jassids, *Empoasca davastans* and another species, and by aphids, the latter occurring quite commonly during the monsoon but less so after the rains.

(*iii*) It was also found that *Bemisia gossypiperda*, the white cotton fly, was capable of transmitting the virus of yellow vein-mosaic to *bhindi* plants.

(*iv*) Leaf-curl of chillies has been shown to be caused by the feeding of thrips, *Scirtothrips dorsalis*, on young leaves and not by virus. No evidence was obtained that leaf-curl was transmitted by the seed, by grafting or by inoculation of expressed juice of diseased plants.

(*v*) Two new virus diseases of beans, *viz.* yellow mosaic of *Phaseolu lunatus* and *Dolichos* mosaic have been found. The former has not so far been transmitted by the inoculation of expressed juice but is easily transmitted by white flies. The latter is sap-transmissible.

(*vi*) In the case of rugose mosaic of tomato, the affected plants are dwarfed and the leaves stunted. The leaflets are thickened and rugose, develop a faint mottle and show a tendency to curl upwards. As the plants grow old there is a marked stunting of the shoots and leaflets and shortening of petioles accompanied by pallor. The virus is transmitted by the inoculation of expressed juice and by white flies.

(*vii*) *Datura fastuosa* is found to be affected by virus, which produces typical green mottling of the leaves. The affected plants are never dwarfed. The virus in this case is also sap-transmissible.

(*viii*) Physiological studies show that nutrient solutions, deficient in nitrogen or phosphorus, exerted a retarding influence on growth and also delayed the appearance of vein-mosaic symptoms. Those plants which received complete nutrient made good growth and were proved highly susceptible to infection.

O.—Miscellaneous

84. *Sub-station, Pusa.*—(*i*) The breeding and testing of crop varieties suitable for North-East India was continued. Isolations were made of bearded early maturing and rust-resistant strains of wheat from hybrid material. From a large number of hybrid barleys and oats under trial, twelve good barleys and fourteen improved strains of oats have finally been selected for further trial. A large number of wilt-resistant pigeon pea hybrids have also been selected.

(*ii*) Yield trials were continued with paddy, wheat and barley.

(*iii*) Ten strains of oats were tried for their yields of green fodder, grain and straw under irrigated as well as non-irrigated conditions. It was found that almost all the strains responded well to irrigation as far as the yield of green fodder or of straw was concerned.

(*iv*) Selection work in maize, soya beans, pigeon peas and genetical studies in barley, oats and pigeon peas were continued. Multiplication of pedigree seeds of different crops and their distribution was done as usual.

(*v*) The permanent manurial and rotation experiments as well as new manurial trials were repeated. Samples of different crops and soils from all plots under experiment were collected for chemical analysis by the Imperial Agricultural Chemist.

85. *Expansion at the Imperial Agricultural Research Institute.*—A special grant of Rs 2,50,000 was received by the Council for financing the expansion of the research work carried on at the Imperial Agricultural Research Institute, New Delhi, along the lines recommended by Sir John Russell. A scheme of work was approved by the Council and funds were allotted for it in 1940.

(*i*) In the Agriculture and Chemistry Sections it is proposed to investigate :

(*a*) the methods of sampling important soils and crops and the standard methods of analysis and of crop examination ;

(*b*) the relative values of nitrogen in green manure, farmyard manures, compost, oil cake and sulphate of ammonia in field experiments estimating the recovery of nitrogen by the crop and of the change in moisture, ammonia and nitrate contents of the soils of different plots, and

(*c*) quality in crops.

(*ii*) In the Entomological Section work will be taken up on population studies of insects.

(*iii*) The mycological work will include—

(*a*) A review of all work on virus diseases of plants done in India so far.

(*b*) The identification of the viruses of important plants by established methods.

(*c*) Testing of established methods of controlling virus diseases with any modifications required to suit Indian conditions.

(*d*) Special studies of the virus diseases of potatoes, tobacco, tomato and the bunchy top of bananas.

(*iv*) The Botanical Section will take up :

(*a*) Cytogenetic investigations on the oleiferous *Brassicae*.

(*b*) Determinations of chromosome numbers of the potato varieties and species of which quite an extensive collection has been made

and the study of meiosis in selected material. (This is intended to throw light on the sterility and abnormal breeding behaviour of certain species), and

(*c*) Collection and registration of the different varieties of crops grown in India starting with wheat.

86. *Agricultural meteorology.*—This scheme was taken over by the Government of India with effect from the 1st April 1940.

(*i*) The wind-break effect in different crops was investigated. These observations are of interest in connection with the lodging of crops during spells of equally wet weather.

(*ii*) Instruments for measuring the amount of rain or irrigation water lost by evaporation and percolation and that actually retained in the soil layers were made and set up for trials. Some instruments for giving frost alarms were manufactured by a local firm and were received for calibration by the Agricultural Meteorologist.

(*iii*) To study the influence of topography on the local climate, comparative observations were arranged at four different stations. Such observations have a practical value in the selection of areas which have a smaller frequency, or low temperatures and are therefore to be preferred for horticultural gardens, *e.g.*, vine gardens.

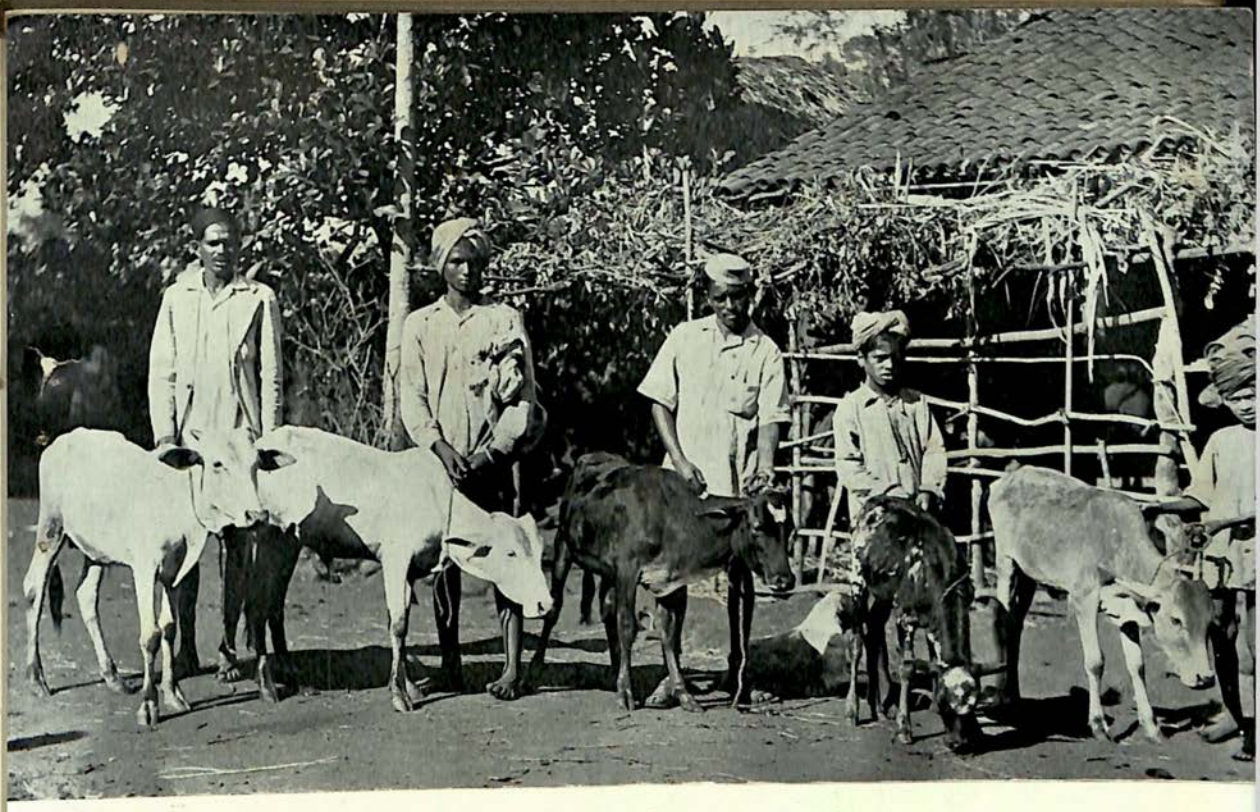
(*iv*) Work on precision observations designed to reveal the effect of weather on crops was continued. Records collected in this connection so far provide a unique set of data for studying the behaviour of the rice crop during six different seasons.

(*v*) Further experience was gained also in applying the methods of sampling to the estimation of the yield of crops.

(*vi*) The number of farm observatories increased during the year. Advice was given to the agricultural departments about the instruments to be purchased for these observatories and calibrating them when obtained.

87. *Survey of the Kurram valley.*—The Government of India desired that a survey should be made of the Kurram valley with a view to ascertain the scope for the economic development of the area. The Council agreed to take up this survey with the aid of a grant of Rs 5,200. An officer has been selected for the purpose and the work will be started shortly.

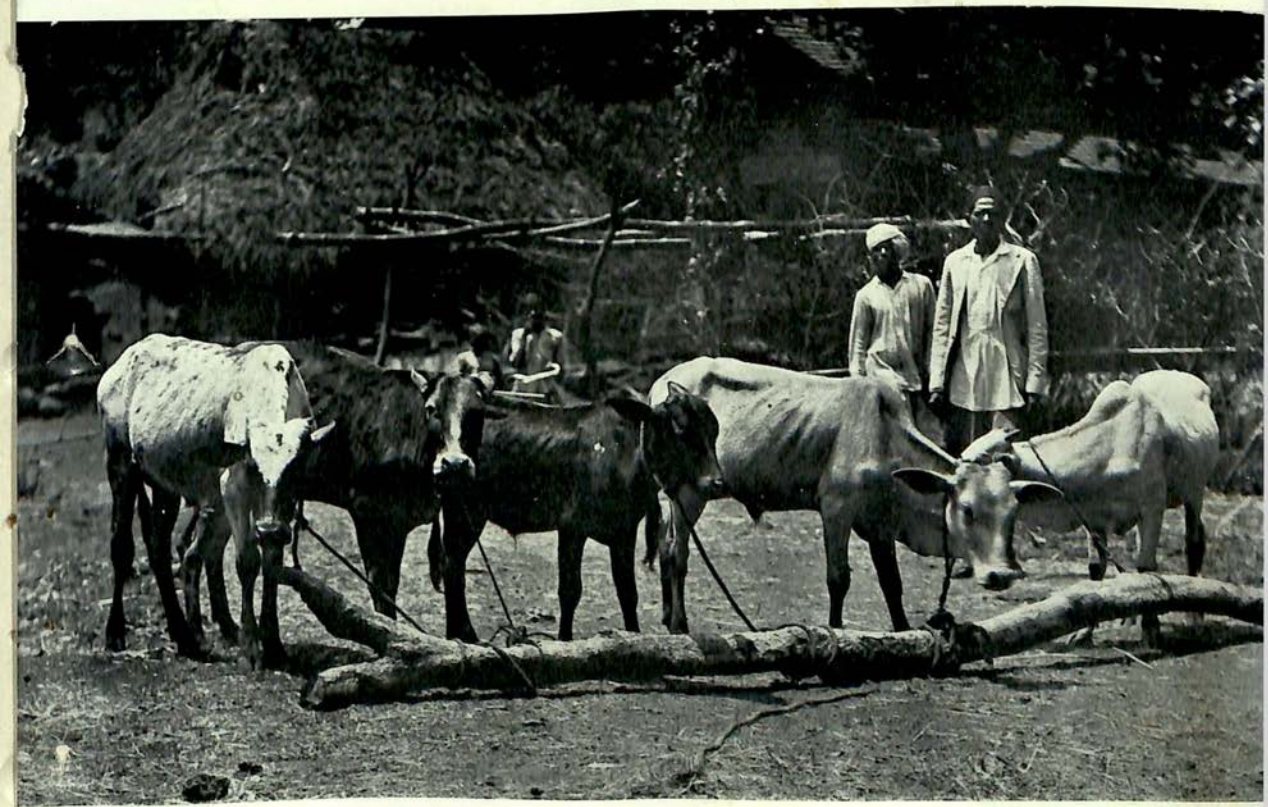
88. *Kans eradication, Bhopal.*—Work on this scheme could not be started till April 1941.



1 to 1½ years-old calves — undipped

●

1 to 1½ years-old calves — regularly dipped



A typical Beetal goat buck
(Government Cattle Farm, Hissar)

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Milk recording of goats
(Government Cattle Farm, Hissar)

CHAPTER III.—ANIMAL HUSBANDRY RESEARCH

A.—Cattle Breeding

89. *His Excellency the Viceroy's cattle improvement drive.*—(*i*) From the information received from provinces, it appears that on 31 March 1940, 2,904 bulls were maintained out of donations (in cash or kind) received in response to His Excellency's appeal, and there was an unspent balance of Rs. 1·38 lakhs out of the cash donations available for the purchase or maintenance of stud bulls. Thus, as compared with the previous year, there was an increase of 100 in the number of bulls maintained and of Rs. 6,000 in the total money available.

(*ii*) The number of approved bulls which were constantly in service in the provinces in 1935-36 was approximately 10,000. As a result of His Excellency's appeal an increase of about 29 per cent had resulted by the end of 1939-40.

(*iii*) The provincial Governments have also shown keen interest in the matter of livestock improvement. Livestock improvement associations have been formed in almost all provinces. A livestock improvement board has been constituted by the Madras Government who are also contemplating enacting a livestock improvement bill. A similar Act already exists in Bombay and the Bengal Government are contemplating legislation for increased provision of stud bulls and veterinary hospitals in Bengal.

90. *Investigation into transmission of genetical factors amongst cattle.* (*Punjab*).—This scheme was sanctioned in December 1940 and is expected to start during 1941-42.

91. *Herd books and Pedigree Registration* (*Punjab.*)—A scheme for the Punjab was sanctioned in July 1939 but is not expected to start till 1 May 1941. Its main objects are to castrate all scrub bulls in the areas in which the scheme is operative and to register cattle of the Hariana and Murrah breeds which conform to the prescribed characteristics.

92. *Definition of breed characteristics.*—(*i*) The definition of the characteristics of the Khillari, and Dhanni breeds of cattle and the Surti, Nili, and Ravi breeds of buffaloes have been approved.

(*ii*) As regards the definition of the Tharparkar breed, it was decided to recognize two distinct types: the larger farm bred animals to be known as Tharparkar and the smaller desert animals as Thari.

(*iii*) A separate committee was appointed to make recommendations about the definition of the breed characteristics of the Malvi breed.

93. *Artificial insemination of livestock* (*Imperial Veterinary Research Institute*).—This scheme was sanctioned in December 1940. It aims at collecting information on the capacity of Indian sires for sperm production, on the reproductive processes in the females of Indian stock and on problems of collection, storage and transport of semen, with a view to introducing artificial insemination of livestock, particularly of cattle in India on a field scale so as to make the best and the most extended use of the very limited number of pedigree sires available in the country.

B.—Goat and Sheep Breeding

94. *Goat breeding* (*United Provinces*).—This scheme was extended till 30 June 1946, but the work will be confined to Barbari goats and that on Jamnapari goats will be discontinued.

(*i*) The total milk yield during the lactation period increased from 465 lb. 11 oz. to 502 lb. 9 oz. in the Jamnapari breed and from 330 lb. 15 oz. to 392 lb. 3 oz. in the Barbari breed during the last eight years.

(*ii*) The average kidding interval decreased from 389 days to 342 in Jamnapari and from 360 days to 288 days in the Barbari breed.

(*iii*) The seventh test of the adult herd for *Brucella* infection was made during the year and out of 177 goats tested only one was positive.

(*iv*) Out of 375 Jamnapari goats 223 (59·5 per cent) kidded during the months of November and December and out of 371 goats 214 (57·6 per cent) were bred in the months of June and July. The kidding season for Jamnapari is November-December and the breeding season June-July. For Barbari these seasons are from October to December and from May to July respectively.

(*v*) There was a good demand for Jamnapari and Barbari males for distribution in villages.

(*vi*) 585 goats from villages were bred to the farm buck.

(*vii*) The cost of production of milk for the year was 8·6 pies per pound.

95. *Goat breeding* (*Punjab*).—This scheme was only started in December 1939.

96. *Angora goat breeding* (*Punjab.*)—This scheme was sanctioned in August 1940. The programme of work for the first year is—

(*a*) to establish an Angora goat (pure and cross breeding) station on a selected site in the montane or submontane areas of the Punjab and also an Angora goat cross breeding station at the Government Cattle Farm, Hissar.

(*b*) to observe breeding, feeding, kidding and shearing data for the remaining years of the scheme.

(*c*) to establish methods for the marketing and utilisation of mohair in collaboration with the Industries Department of the Province.

97. *Sheep breeding* (*Madras*).—The scheme was initiated in 1938.

(*i*) During 1939-40 the sheep gained on the average 9½ lb. each in weight.

(*ii*) There were 151 births during the year. The mortality amongst the lambs born in September and October was very high, almost 50 per cent of them died. Those born in October 1939 were all affected with parasitic infection and the growth of live weight and height was much arrested.

(*iii*) A study in live weight and height was carried out with the second crop of lambs. Average weight at birth was about 5 lb. 5 oz. and the weekly increase was from 1 lb. 10 4/5 oz. to 1 lb. 12½ oz. Lambs at birth measured from 14½ to 14 4/5 inches and the averge weekly increase in height was from 0·46 to 0·47 inch.

(*iv*) The breeding rams were fed on concentrates throughout the year. The ewes were given 3/4 lb. concentrated food per day before they were mated and during the mating season. They were also given this food one or two weeks before and after lambing. The sheep were grazed daily and were given green grass, lucerne, hay and silage at night.

(*v*) The mating seasons are April and October and the average percentage of fecundity in both the flocks works out at 83·5 to 90·1.

(*vi*) The mortality among the flocks was very heavy during November 1939 to March 1940. It was due to parasitism and purulent pneumonia.

(*vii*) The average wool yield per year was 2 lb. 7¾ oz. per head.

(*viii*) The white flock was clipped thrice during the year.

98. *Sheep breeding* (*Bombay*).—The scheme was started in 1937.

(*i*) The establishment of a sub-station was sanctioned in December 1940. The object of this sub-station is to try out the results obtained in the Bhambhurda Farm under actual farm conditions. It is intended under this scheme to associate the shepherd's flocks in the villages with the scientific work in progress and thus provide controlled flocks for the introduction of better systems of management and the investigations of sheep disease.

(*ii*) The purchase of 100 ewes per annum for the next three years to allow for rigid selection and culling in order to achieve better results was also sanctioned.

(*iii*) Further studies in the adaptability of Merino sheep to Deccan conditions were conducted and from the results so far obtained it is hoped that there will be little trouble in getting the best out of the Merino rams on this farm.

(*iv*) Experiments in crossing Deccan sheep by Merino were continued; four types of lambs are born as differentiated by the colour of the fleece, *viz.*

(*a*) All black.

(*b*) Spotted.

(*c*) White with black face.

(*d*) All white.

(*v*) The shepherd provides optimum grazing conditions by itinerating. As the farm flock is stationary on a particular area, this difficulty was solved by storing young hay. It is found that the best time to cut hay is the middle of July.

(*vi*) A study of wild pasture legumes was made and it was found that their nutritional value on a dry basis was higher than that of lucerne. An analysis of the useful bushes showed that they were very valuable in making up part of the mineral deficiency of the grasses.

(*vii*) A note was prepared on Tenguri sheep—a hairy breed found in the southern part of the Bombay-Deccan. These sheep present an appearance of purity of type. The possibilities of developing this breed into a mutton type sheep is under study.

(*viii*) A wool utilisation section was established at the farm with the object of finding out ways and means of utilising the small produce in villages so that sheep improvement work is not hampered at the outset. A simple method of turning the single yarn into plies has been worked out on the foot *charkha*. Spinning tests of different types of wool available on the farm were carried out and gave encouraging results. A variety of coloured dyes in browns, yellows, tans, khakis and greys have been worked out from shrubs available on the farm.

99. *Sheep breeding* (*Punjab*).—The work was started in 1937.

(*i*) The best mating period is from 1st March to 31st May; about 93 per cent matings were successful during this period.

(*ii*) Work on effects of in-breeding on the physical development of stock was continued.

(*iii*) The study of the gestation period on 95 ewes was completed during the year, and showed an average figure of 152 days.

(*iv*) Observations on the detailed study of oestrum in sheep indicate that (*a*) ewes come regularly in heat all the year round, and (*b*) the average period of heat is higher during summer than in winter.

(*v*) The comparative study on the effects of *barani* grazing and grazing on stubble showed that after the first year the flock on *barani* grazing yielded slightly lesser amount of wool.

(*vi*) An experiment to observe the effects of grain feeding to ewes carried out during the year showed that lack of nutrition retards the development of the inherent potential qualities of sheep.

(*vii*) Castration retards the increase in body weight and the development of skeleton. The growth of wool is also diminished.

(*viii*) Abortion, Johne's disease, Encephalomyelitis, Ophthalmia, occurred in the flock during the year but did not cause any serious loss.

(*ix*) The grading and washing of wool in the hope of obtaining better prices did not prove encouraging.

100. *Sheep breeding* (*Bihar*).—This scheme was sanctioned in December 1940.

(*i*) The main object of the scheme is to produce white sheep which will breed true to type.

(*ii*) The scheme will start with a selected lot of 200 ewes and 8 rams. The ewes will be divided into 4 lots of 50 each. The rams will be kept separate and will be allowed access to the ewes only during the mating season. All ewes and rams will be suitably marked by tatooing and detailed records of each lot will be kept. Only white wooled animals will be kept and the rest will be disposed of as occasion arises.

(*iii*) The local practice is to feed no concentrates of any kind. In the scheme one out of four lots will be fed with gram, oil cake and a mixture of gram and oil cake to observe the effect on the quality of wool. Gram will be given at the rate of 1 lb. per ram, ½ lb. per ewe and ¼ lb. per lamb. The other feeding stuffs will not exceed these quantities. When grazing is not available or is scanty, as during the hot weather, the animals will be allowed a small quantity of ensilage or green fodder, whichever may be available, to supplement the grazing. Special attention will be paid to determine those seasons during which feeding with concentrates is required.

(*iv*) Castration of lambs at an early age, when 3 to 4 weeks old, will be undertaken in one lot to observe the effect of this on the market value of the lamb.

(*v*) An attempt will be made in the third year to select rams to establish a uniform woolly type of animal.

(*vi*) Shearing will be done according to improved methods and regular drenching for helminth parasites and attention to hoofs will form a regular routine practice.

(*vii*) The economics of gram-feeding will be worked out to see how far the cost of such feeding is covered by the increased yield of wool, etc.

101. *Breeding of lambs with Karakul pelts* (*N.-W. F. P.*).—This scheme was sanctioned in December 1940.

(*i*) It is proposed to purchase four pure Karakul rams from Afghanistan and 200 ewes of Hashtnagri breed as far as possible of uniform colour and hairy wool. The ewes and rams will then be divided into two batches, 2 rams to 100 ewes, they will all be numbered by ear clips and descriptive rolls prepared for them.

(*ii*) Service records of all ewes and rams will be prepared, the progeny will be graded and desirable ewes selected for further breeding and undesirable ewes culled.

(*iii*) Steps will be taken for the proper curing and preservation of pelts.

(*iv*) The effect of different foods (concentrates) on Karakul pelt production will be ascertained.

(*v*) The sheep will be weighed periodically and dosed.

102. *Sheep breeding* (*Mysore*).—This scheme was sanctioned in July 1939 but work on it did not commence till November 1940. The object of the scheme is to improve the quality as well as the quantity of the black and white wool produced in the state. A central farm will be started with the best available sheep of both colours and selective breeding for improvement of quantity and quality will be continued.

103. *Sheep breeding* (*Kashmir*).—Work on this scheme was started in April 1940. Its object is to ascertain which of the four imported breeds of sheep, *viz.* Merino, Cheviot, Border Leicester and Wensley Dale would be most suitable for improving the wool of the indigenous sheep in Kashmir State.

C.—Animal Nutrition

104. *Animal nutrition* (*Coimbatore*).—This scheme has been in operation since 1935.

(*i*) Mineral metabolism work was continued on the Kangayam and cross-bred cows. The results of the year confirmed those of the previous year that for growth and pregnancy, the requirement was of the order of 35 gms. each of CaO and P_2O_5 while for milking the requirement of P_2O_5 remained about the the same but that for CaO depended on the quantity of milk yielded and was about 70 gms. for 15 lb. milk per day.

(*ii*) Field investigation of the disease among cattle known as 'Vayu-potlu' was done in certain taluks of the Kurnool district to study the incidence of the disease and also of the fluorine content of well waters of affected villages. Methods of removal of fluorine were investigated and it was found that the addition of lime removed the greater part of the fluorine from well waters.

(*iii*) The pasture survey under the scheme was extended to the districts of Cuddapah, Anantapur, Bellary, Kurnool, Chittoor, Coimbatore, Nilgiris and Salem. Areas of deficiency in P_2O_5 were noticed in the Anantapur and Kurnool districts.

(*iv*) Manuring with ammonium sulphate caused a high uptake of nitrogen but a reduced carbohydrate metabolism. The nitrogen taken up by the plant remained in the inorganic form owing to lack of carbohydrate for the synthesis of proteins. The metabolism of plants manured with cattle manure and not manured at all was more normal and resulted in protein synthesis.

(*v*) Short duration varieties of paddy were found to have a higher biological value than the long duration varieties and the white starchy rices had a better biological value than the Glutinous varieties (Puttu).

(*vi*) Grasses on differently manured plots were studied for their chemical composition. Ammonium sulphate gave a higher nitrogen content while cattle manure gave a higher P_2O_5 content.

105. *Animal nutrition* (*Bengal*).—This scheme has been in operation since 1st July 1932 and is due to expire on 31st December 1941. The question of the further extension of the scheme is under consideration.

(*i*) Comparative feeding and digestion tests with straw from two different varieties of rice, *viz. aman* or winter variety, grown in low-lying and submerged area, and *aus* or autumn variety, grown in high lands, were conducted. The straw consumption was definitely higher under *aus*, being about 25 per cent in excess. The superiority of *aus* straw is due to (1) better consumption and possibly better palatability, (2) better protein content and (3) larger mineral supply.

(*ii*) Feeding and metabolic test with freshly harvested *aus* straw under different combinations was also conducted but the data are still incomplete.

(*iii*) Preliminary work in interfering substances in the way of lime assimilation under rice straw feeding indicates the presence of oxalic acid and possibly other interfering substances which in some instances appear to remain in a quantity sufficient to precipitate out the entire lime present in the straw.

(*iv*) Investigations regarding composition of some of the local grasses, fodder and cattle feeds were conducted. Some of the local grasses were found to be quite rich in nitrogen. Marked variations in nitrogen content in different varieties of *aus* rice was detected.

(*v*) Some preliminary work on rice by-product was done. This work originated chiefly from the peculiar behaviour of the phosphorus components present in the stuff which do not seem to be easily assimilable. The idea therefore is to work out any process by which the assimilability of the components can be improved. As a preliminary measure samples from some of the mills were collected and 15 analyses on the organic side are reported.

(*vi*) Studies in regard to comparison of the yield of rice straw and grain on air dry basis and over dried basis were done. It was found that the percentage of dry matter did not vary appreciably between straw and grain.

106. *Cattle feeding* (*U. P.*)—(*i*) Experiments to find out the effects on growth of replacing concentrates by gress berseem were taken up at Madhurikund Farm. It seems that concentrate mixture is slightly more efficacious than green berseem for growth, for both Hissar and Murrah breeds.

(*ii*) The gain per unit weight of digestible proteins is higher for concentrates than for berseem with both Hissar and Murrah, showing that the quality of berseem protein is slightly inferior to the proteins supplied by the mixture of concentrates. The rate of growth obtained even with maximum replacement of concentrates by berseem compares favourably with what could be expected under normal conditions. The cost of production per unit of growth is minimum in the case of heifers getting the maximum nutrients in the form of berseem. As the above observations are of great practical significance this experiment is being repeated with a larger number of animals.

(*iii*) The heifers were again tested for effect of replacing concentrates by berseem hay on growth. Quite satisfactory growth was obtained when concentrates were replaced by berseem hay to the extent of 50 per cent or 75 per cent though slightly inferior to that with concentrates alone.

(*iv*) The value of berseem hay protein as well as that of total digestible nutrients is lower for the Murrah breed than for Hissar. The cost of producing

the same live-weight is much lower for the berseem hay groups than that of full concentrates. If green berseem is properly cured it can furnish a good quality hay, in which there may be little loss of nutrients.

(*v*) Effect of replacing concentrates with green berseem on milk yield was investigated with Hissar and Murrah cows. The difference between the milk yield of the various groups is not statistically significant, although there is a tendency for the berseem groups to give lower milk yield. The animals of the berseem groups maintained their live-weights as efficiently as those of concentrate group. The cost of producing milk was the least in the case of animals receiving 75 per cent berseem and 25 per cent concentrates. In order to confirm these observations the experiment is being repeated with a larger number of animals.

(*vi*) Effect of replacing concentrates with berseem hay on milk yield was investigated with Murrah cows. There was no difference in the average milk yield of the group getting full concentrates and that getting 50 per cent of the concentrates replaced by berseem hay. The live-weights were also maintained as efficiently by berseem hay as with concentrates. There was practically no difference in the composition of milk obtained from different groups. The cost of producing milk was maximum with the full concentrates ration. The best returns were obtained when berseem hay replaced 50 per cent of the concentrates.

(*vii*) The average composition of milk for two breeds Hissar and Murrah at Bharari Farm was determined. Records of yields of berseem were maintained both at Bharari and Madhurikund Farms in order to find out the stage of different cuts for the maximum return of nutrients and also to compare the variation due to different soil character and other factors. It has been observed that protein and fat contents decrease with the maturity of berseem, whereas fibre content gradually increases. A slight increase in the calcium content and a slight decrease in the phosphate content are also noticeable with age.

107. *The feeding values of certain food grains, oil-seeds and oil-seed cakes* (*Punjab*).—(*i*) The animals employed on the trial were Montgomery heifers.

(*ii*) *Taramira* seed was fed to one group of animals, together with oat hay as basal ration but the seed was not relished by the animals whose health deteriorated considerably.

(*iii*) *Sarson* cake is a common feed in the central parts of the Punjab and is much relished by cattle. The digestibility data for this cake fed at two different times of the year on the two different sets of heifers correspond fairly well.

(*iv*) *Toria* cake is commonly fed in the canal colonies. It has a slightly bitter taste and is somewhat richer than *sarson* cake in protein, and no trouble whatever was experienced with the animals fed with this. It is poorer in digestible fat than *sarson* cake and consequently shows a lower total content of digestible nutrients.

(*v*) *Taramira* cake is a popular feed in the north-west Punjab and is supposed, rightly or wrongly, to have a cooling effect. It is, however, distinctly pungent, has a disagreeable odour, and the aimals showed a disinclination to eat it to begin with, but they got used to it after some time. In chemical composition it resembles *sarson* and *toria* cakes and the digestibility figures show that the total carbohydrates and dry matter in *taramira* are more digestible than those of *sarson* and *toria* cakes, while the digestibility figures of the protein are much the same.

(*vi*) Linseed cake is not commonly used by Punjab zamindars, but is extensively used in dairies and to some extent in the north-east districts of the Punjab.

(*vii*) Groundnut cake has only recently come into use as a feeding stuff in the Punjab, but it is not yet extensively used nor has it gained from stock owners the recognition it appears to merit. It is an excellent cake as regards taste and appearance and of those so far tested is richest in digestible proteins.

108. *Nutritional requirements of milch cows.*—This scheme was sanctioned in December 1940.

(*i*) The data obtained from feeding heifers on oil-seeds, oil-seed cakes and certain food grains will be applied to the rationing of milch cows.

(*ii*) A preliminary to this work will be a study of the efficacy of the existing Lyallpur College ration and experimental readjustment of this ration, if necessary, to a different feeding standard.

(*iii*) This work will serve as a basis and introduction to the work to be carried out to see how far high priced concentrates of the ordinary dairy ration can be replaced wholly or in part by oil-seeds and oil-seed cakes.

(*iv*) After the work with the existing dairy ration, the first study made will be with fuzzy cotton seeds and cake made from it. This particular investigation will be made as thorough as possible for the specific purpose of throwing light on the alleged depression in milk yield if it is fed to cows.

109. *Feeding value of indigenous fodders (Bihar).*—This scheme is due to expire on 30th September 1941. The question of its extension is under consideration.

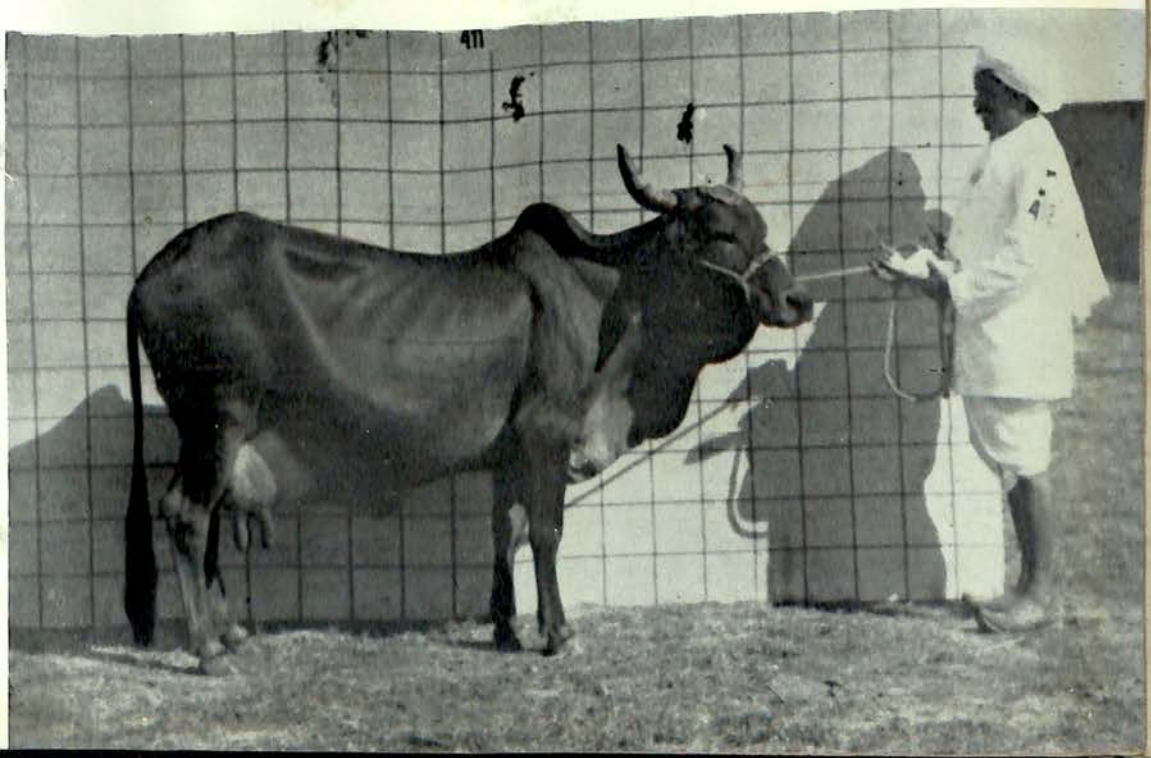
(*i*) Berseem continued to remain on the top of the list of fodders giving very high protein and mineral contents. *Meth* continued to occupy the position next to berseem. Paddy straw and *jowar* occupied the lowest position. Maize continued to occupy a position better than *jowar* and paddy straws. Napier grass also held its intermediate position between rich fodders like berseem and *meth* and the poorer fodders like maize, *jowar*, barley and paddy straw. Generally the fodders showed a decrease in the constituents determined except nitrogen-free extract which showed an increase, as their ages advanced. Influence of soil conditions were noticeable in the case of fodders from Kanke which were poorer than the same fodders grown at Sabour, Patna or Pusa. No general conclusion about the seasonal effect could be drawn.

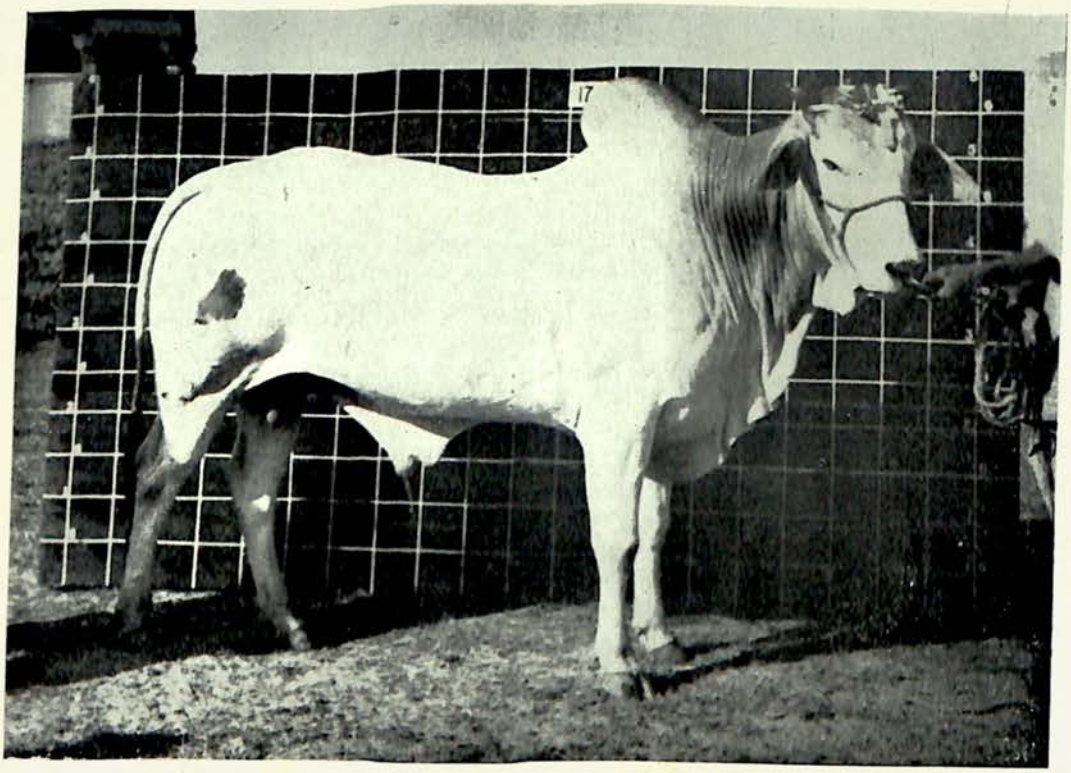
(*ii*) As a result of analyses of samples collected from manurial trials it seems that although there is not much difference in the treatments themselves the general effect of manuring with compost, compost *plus* ammonium sulphate and farmyard manure *plus* ammonium sulphate have been to increase the HCl, soluble ash and phosphate in paddy straw at Patna, Pusa and Kanke while potassium has been increased in addition to the above mentioned places at Sabour also. In general nitrogen and phosphate, singly and in combination, have tended to increase the crude fibre, HCl soluble ash, and K_2O in barley straw. Nitrogen alone or in combination with phosphorus, calcium and PCa increases the protein content, the highest value being given by the combination NP. Ca alone increases the uptake of calcium and phosphate. P alone and in combination with calcium slightly increases the phosphate content over control.

(*iii*) This scheme also corroborates the continued success of berseem as a fodder rich in protein and minerals.

The best bull in the All-India Cattle Show, 1941
This bull, a beautiful specimen of the Sindhi breed, was exhibited by the Livestock Officer, Sind

Sindi cow





Hariana bull

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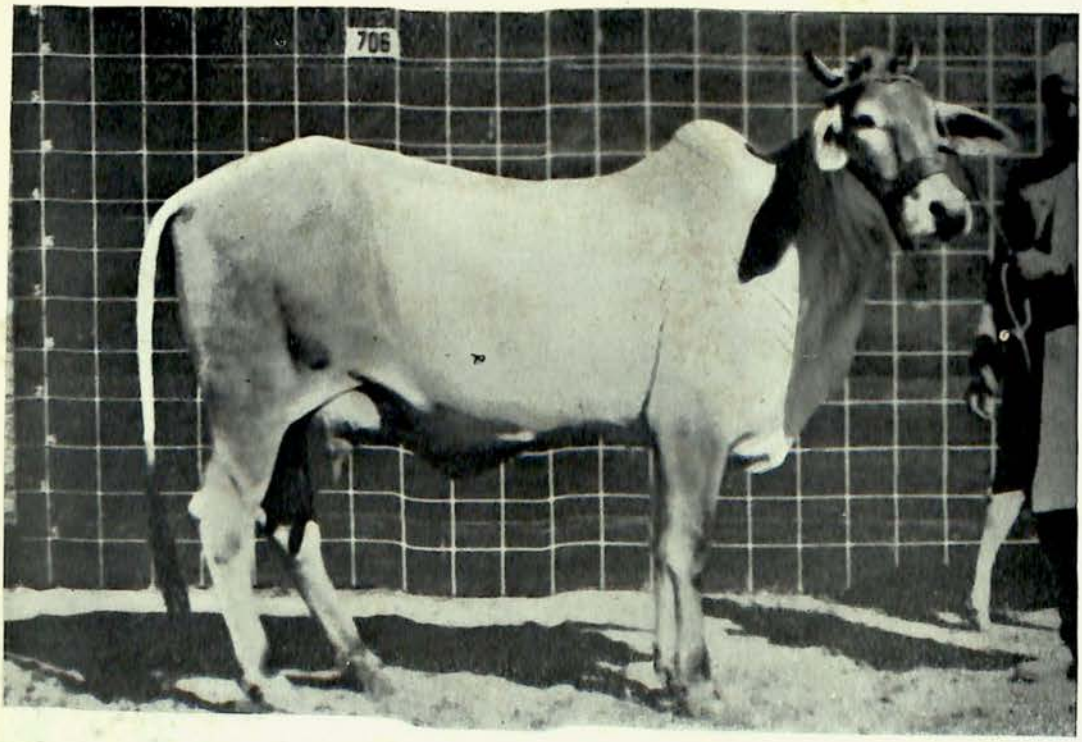
Hariana cow



110. *Cattle nutrition (Assam).*—This scheme was sanctioned in 1938 but has been brought into operation only recently, owing to difficulties in recruiting the officer in charge. Its object is to investigate what nutritional defects are responsible for the poor physique and milk yield of the cattle in Assam.

111. *Drying of grass (Bombay).*—This scheme was sanctioned in December 1940.

The work will include the investigation of the time and interval of cutting grasses, testing of the moisture content of the grasses, a study of the effects of storage on dried grass, the determination of the thermal efficiency of different fuels, the economics of working the grass driers, the ascertainment of the protein and carotene contents of grass at the time of cutting and at successive stages of drying and storage and of the correlation of the feeding of protein to milk production.

112. *Manufacture of cattle-feed from molasses (Imperial Veterinary Research Institute).*—A grant of Rs. 10,000 was sanctioned in December 1940, for carrying out preliminary experiments on bullocks alone for a period of six months, to ascertain whether the feeding of molasses is accompanied by any undesirable effects.

D.—Animal Diseases and Pests

113. *Veterinary Investigation Officers—General.*—(*i*) These schemes were extended up to the 31st March, 1942 and it was recommended that after that date the cost of the scheme should be divided equally between the Council and the provinces or states concerned. The matter is under consideration in consultation with the Governments concerned.

(*ii*) The Advisory Board in November 1940 passed the following resolution in regard to tuberculosis and Johne's disease of cattle in India :—

" The Board note with alarm the spread of tuberculosis and Johne's diseases among cattle in India and invite the attention of the authorities concerned to the necessity of taking early steps for detection and for ascertaining the incidence of the diseases in the villages. They note that according to the advice of experts the only suitable action for dealing with the disease is to dispose of the affected animals by destruction, but as this was not feasible in this country the best course was for the provincial Governments and states concerned to arrange for the segregation of such animals either directly themselves or indirectly with the help of *pinjrapoles* and *gowshalas* which might, if necessary, be subsidised for the purpose ".

The resolution has been commended to the provincial Governments and constituent states.

114. *Veterinary Investigation Officer, Madras.*—(*i*) Investigation was continued on the following diseases :—

(*a*) *Cattle diseases.*—Hæmorrhagic septicæmia, brucellosis, osteomalacia-like disease, chronic hæmaturia and other diseases such as Johne's disease, nasal granuloma, theileriasis etc. encountered during the course of the investigation.

(*b*) *Sheep and goat diseases.*—Contagious caprine pleuro-pneumonia, anthrax, rinderpest, circling disease, strike or entero toxæmia, Johne's disease and other diseases.

(*ii*) In the various cases the scenes of actual outbreak were visited and the usual post-mortem conducted. The observations on osteomalacia-like disease

are of interest and were continued in a number of villages. Working animals were mostly affected by this disease. Buffaloes and cows were also found affected showing symptoms of arched back, stiffening, pain and abortion. The disease was recorded in sheep also but not in goats. It was also recorded in human beings. The sole cause of the condition has been attributed to fluorine content of water and mineral imbalance in the diet. The disease is stated to be more prevalent in areas of groundnut cultivation especially the variety which spreads above the ground. It was less in areas of wet cultivation and the affected aniamls were cured when fed with bone meal and paddy straw. The Advisory Board remarked that it would be an advantage if the cause of the disease would be established in collaboration with the Imperial Veterinary Research Institute. Yet another disease, the circling disease of sheep, was found the cause of which is also obscure. The necessary post-mortem examinations were conducted and material collected and sent to the Madras Veterinary College. Transmission experiments will have to be tried as suggested by the Imperial Veterinary Research Institute. This disease is becoming very prominent in several provinces besides Madras and the work done at present at the Imperial Veterinary Research Institute suggested it to be encephalomyelitis.

115. *Veterinary Investigation Officer, Bombay.*—(*i*) Work was continued on the following diseases :—

(*a*) Cattle diseases.—Tuberculosis, Johne's disease, bovine mastitis, bovine abortion, nasal granuloma and tick infestation.

(*b*) Sheep and goat diseases.—Pasteurellosis, foot and mouth disease and tick infestation.

(*ii*) In addition Ranikhet (Doyle's) disease among fowls was investigated in three villages. A fatal outbreak of disease among cats was also investigated. It was of interest as it is frequently reported that such outbreaks precede outbreaks of human plague ; this requires confirmation. An organism suspected to be the cause of the disease (Feline hæmorrhagic septicæmia) was isolated and further work is proceeding.

116. *Veterinary Investigation Officer, Bengal.*—(*i*) Investigation was continued on rinderpest, humpsore, Ranikhet (Doyle's) disease, fowl pox, piroplasmosis in cattle, pleuro-pneumonia in goats, anthrax, verminous pneumonia in goats, bovine lymphangitis, bovine enzootic hæmaturia and other miscellaneous diseases.

(*ii*) A serious epidemic of rinderpest appeared in Darjeeling district. The disease appears to have been gradually spread to the lower valleys of Teesta. The cattle of the hills, especially a large proportion of which constitutes imported European breeds which are highly susceptible to rinderpest, required special and skilled measures of control. By means of sero-vaccination and serum-alone methods and sanitary police measures the disease was brought under control within a period of a fortnight.

(*iii*) The study of susceptibility of buffaloes to rinderpest revealed that mortality in buffaloes in Bengal was almost double that of cattle of the plains.

(*iv*) Investigations were also made regarding the degree of susceptibility of cattle and buffaloes to rinderpest in Bastar State (Eastern States Agency) and the possibility of application of goat tissue vaccine as a prophylactic agent.

(*v*) As a result of the experiments with certain drugs a permanent cure for hump-sore appears to be in sight. A few cases of hump-sore in camels were recorded.

(*vi*) Piroplasmosis appeared in Hariana cows newly imported from the Punjab and the drug ' Acaprin ' appeared to effect a permanent cure.

(*vii*) A serious outbreak of pleuro-pneumonia in goats occurred which seriously hampered their export. The disease was investigated for the first time in Bengal and findings of the causative organism were given.

(*viii*) A wide-spread outbreak of anthrax appeared in Tippera district. This was investigated and promptly brought under control by immunisation of cattle and sanitary police measures.

117. *Veterinary Investigation Officer, United Provinces.*—(*i*) Special attention was paid to perfecting the scarification method of vaccinating cattle and buffaloes against rinderpest, to the diagnosis of tuberculosis and Johne's disease and the investigations into ' Bisi ' in domestic ruminants, surra in bovines and equines, sheep and goat diseases, Ranikhet (Doyle's) disease in fowls and fodder poisoning in cattle.

(*ii*) Results of particular interest and value which may be utilised by the field staff have been achieved in connection with the treatment of ' Bisi ' in cattle by carbon tetrachloride and in sheep and goats by copper sulphate, prophylactic and curative treatment of bovine surra by potassium antimony tartarate and the serum simultaneous inoculation of hill cattle and buffaloes using a reduced dosage of ordinary *anti*-rinderpest serum and goat tissue virus.

118. *Veterinary Investigation Officer, Punjab.*—(*i*) The following diseases were investigated : Tuberculosis, rinderpest, encephalomyelitis in sheep, sheep pox, goat pneumonia, coccidiosis in dogs, Ranikhet (Doyle's) disease in fowls, fowl pox, liver fluke disease in cattle and surra in horses and cattle.

(*ii*) An obscure disease broke out among cattle in the Government Cattle Farm, Hissar. The disease was mostly confined to young stock. Some diseased animals responded to the treatment by *anti*-rinderpest serum and showed improvement in their condition. The results of the material sent to the Imperial Veterinary Research Institute, Mukteswar are awaited.

(*iii*) Circling disease was recorded for the first time in this province.

(*iv*) The famine in certain parts of the province which resulted in malnutrition and necessitated herding together of cattle may be one of the causes for the observed rise in the incidence of tuberculosis.

119. *Veterinary Investigation Officer, Bihar.*—(*i*) Investigation made included enzootic otorrhœa in buffaloes, horn cancer, retention of urine, parotiditis in cattle and buffaloes, dermorrhagia, *Kanthsar*, necrosis of horn, bovine contagious abortion, anthrax, mange in goats, epidemic of parasitic diarrhœa in goats and sheep, nasal granuloma in goats, Ranikhet (Doyle's) disease and fowl pox.

(*ii*) An extensive tour was also undertaken to collect data regarding the development of the cattle industry in the Kosi region. The survey of the area indicates that this is very suitable for the development of cattle and buffalo breeding, but before any improvement can be expected in this direction it will be necessary to make additions to the existing small veterinary staff who could attempt to bring the diseases and parasites existing in this area under control.

120. *Veterinary Investigation Officer, Central Provinces and Berar.*—(*i*) Interesting data on the various diseases prevalent in the province were obtained.

(*ii*) Further study into the incidence of coccidiosis in cattle and buffaloes, revealed beyond doubt the pathogenicity of the new variety of coccidia *Eimeria smithii*.

(*iii*) The other important findings were " Rhinosporidiosis " in a cow *Brucilla melitensis* in a goat as the cause of abortion and deficiency disease in a fowl resembling " Rickets ".

(*iv*) Some useful information about the prevalence of different diseases among goats and sheep were also collected.

121. *Veterinary Investigation Officer, Assam.*—(*i*) Investigation into *kumri* in horses was continued.

(*ii*) An outbreak of bovine pleuro-pneumonia was investigated and a detailed survey on the epizootology was carried out.

(*iii*) A comparative diagnostic test with Johnin and avian tuberculin simultaneously in 206 cattle of Government farms was carried and certain interesting observations were recorded.

(*iv*) The value of mineral feeding in relation to Johne's disease was also studied.

(*v*) Cases relating to theileriasis, grass poisoning in cattle, microfilariasis, rinderpest, bovine infectious lymphangitis, goat pox, ecthyma in goats, mastitis, otacariasis in buffaloes, warts, gangrane of tail, bovine abortion and surra were investigated.

(*vi*) Young stock, particularly calves of about 2 to 6 months old, suffering from theileriasis appear to manifest symptoms of ill-health unlike the adult or old animals which harbour the parasite without manifesting the clinical symptoms.

(*vii*) The result of vaccination against rinderpest with goat tissue vaccine as a prophylactic measure as well as in actual outbreaks, has been encouraging.

122. *Veterinary Investigation Officer, N.-W. F. P.*—(*i*)-The main problem tackled was the local preparation of goat tissue virus and its use as a prophylactic and in the face of outbreaks of rinderpest. Over 3,000 head of cattle were thus inoculated.

(*ii*) It is hoped that the interesting experiment designed to check the introduction of rinderpest into the province from the neighbouring provinces and states by establishing vaccination centres on the frontiers, would be successful.

(*iii*) Experiments were continued by the officer to determine the efficiency of carbon tetrachloride and Kamala and *babrang* in the treatment of liver fluke and economic aspect of this treatment under field conditions.

(*iv*) 275 cattle and 106 buffaloes were tested with tuberculin and of the positive reactors one cow was destroyed and tuberculosis was confirmed at post-mortem.

(*v*) An outbreak of bovine surra in buffaloes was investigated and controlled with Bayer 205.

(*vi*) A severe outbreak of anthrax in sheep in Hazara district was detected and controlled with *anti*-anthrax serum.

(*vii*) Sheep pox and goat pox vaccines manufactured at Mukteswar were tried in the field on an experimental scale and have so far proved ineffective.

(*viii*) Plant poisoning in sheep and goats was investigated in the Khyber Agency and in the Peshawar and Hazara districts. Suspected plants were sent to Mukteswar for analysis and experimental work.

(*ix*) Camphor and indigenous drugs in pill form were tried without success in Ranikhet (Doyle's) disease.

123. *Veterinary Investigation Officer, Sind and Ajmer-Merwara.*—(*i*) The officer investigated the following diseases prevalent in the province :—

(*a*) Goat diseases.—Rinderpest, *wah*, contagious pleuro-pneumonia, *pitto* or *gillar*, abortion, mange, gangrenous mastitis, hepatitis and pneumonia, anthrax and plant poisoning.

(*b*) Cattle diseases.—Liver fluke and circling disease.

(*c*) Poultry diseases.—Lice infection, scaly legs and Ranikhet (Doyle's) disease.

(*ii*) An obscure disease in cattle had been noticed at Karachi Sewage Farm for the last few years and up till now the factor causing the deaths has not been determined. Anthrax, hæmorrhagic septicæmia and hydrocyanic acid poisoning have been suspected from time to time but each time microscopical, biological and chemical examination has proved it to be not so.

(*iii*) An outbreak of anthrax in sheep and goats was controlled by means of serum alone method.

(*iv*) Lice infection in fowls was successfully treated with single dip of sodium fluoride and scaly legs of fowls were successfully treated with carbolized vaseline and petrol. Ranikhet (Doyle's) disease in fowls was controlled by the slaughter of diseased birds and thorough disinfection of premises and chicken houses.

(*v*) A case of anthrax in a dog has been recorded for the first time.

124. *Veterinary Investigation Officer, Orissa.*—(*i*) Tuberculosis, black quarter, hæmorrhagic septicæmia, Ranikhet (Doyle's) disease, coccidiosis, fowl pox, sarcoptic mange, hump-sore, Johne's disease, contagious bovine abortion and bovine encephalomyelitis were among the diseases investigated.

(*ii*) A high incidence of tuberculosis among conservancy bullocks in Puri Municipality was observed and is presumably due to the lurking of the infection in the stalls for more than a decade and also due to mal-nutrition apparently evident from the finding of low serum calcium contents in a few bullocks.

(*iii*) The outbreak of hæmorrhagic septicæmia in a certain tract of the province has assumed a severe enzootic form, causing a high mortality of cattle in a group of low lying swampy and marshy villages.

(*iv*) The evolution of poor types of animals observed in many rural areas is due to low calcium content of the grasses available.

(*v*) An outbreak of coccidiosis took a heavy toll among chicks at the Agricultural Farm, Angul. Idocasien in drinking water and arrangements for keeping the healthy chicks in specially made chick houses with wire-netting floors for avoiding infection from the contaminated soil have contributed to the control of the outbreak.

(*vi*) Three days' sickness broke out in a village in Puri district in an epidemic form with no mortality.

125. *Veterinary Investigation Officer, Hyderabad.*—(*i*) Rinderpest tissue vaccine manufactured locally was found potent and viable at room temperature up to 8 days and after refrigeration for 24, 48 and 72 hours and then at room temperature up to five days.

(*ii*) Surra both in equines and bovines was investigated and 40 cases were confirmed.

(*iii*) No cases of tuberculosis and Johne's disease were noticed.

(*iv*) Further investigation of osteomalacia showed deficiency of phosphorus in fodder as well as in soil.

(*v*) Water analyses for evidence of endemic fluorosis is under investigation.

(*vi*) Wide-scale *anti*-snail operations were done in co-operation with ryots in the Nizamsagar liver fluke area.

(*vii*) An outbreak of equine encephalomyelitis was diagnosed and confirmation obtained from Mukteswar.

(*viii*) Rinderpest spread from cattle to sheep and goats was investigated.

(*ix*) A suspected outbreak of bacillary white diarrhœa was investigated.

126. *Johne's disease—Mysore.*—This scheme was extended for one year till 31st August 1941. The question of its further extension is under consideration.

(*i*) An epizootological survey was undertaken to assess the incidence of Johne's disease in the cities of Bangalore and Mysore. A house to house search for suspicious clinical cases was made and with the help of a questionnaire drawn up for the purpose, it was ascertained that four per cent of the cattle inspected in Bangalore City and 1·4 per cent of cattle inspected in Mysore City are suspected to be suffering from Johne's disease by their clinical appearances and histories. The examination of a number of suspected cases from the Imperial Dairy Farm and the Hosur Cattle Farm revealed that the majority of them were infected with the disease.

(*ii*) An advanced case of Johne's disease was diagnosed in a young Amritmahal cow belonging to the Ajjampur Cattle Breeding Station.

(*iii*) Clinical cases of Johne's disease among sheep were found.

(*iv*) A technique for staining sections for histological study was devised.

(*v*) Johnin was prepared in the laboratory and tested on the animals in the experimental herd. The Director of Veterinary Services, Assam, the Superintendent, Hosur Cattle Farm and the Coimbatore Agricultural Farm were supplied with Johnin from this laboratory. The results of tests by them confirmed the superiority of Johnin to avian tuberculin as a diagnostic agent.

(*vi*) Attempts were made to transmit the disease to sheep, goats and small laboratory animals, *e.g.* guinea pigs and rabbits. The effect of infecting them with an emulsion of Johne's bacillus in paraffin oil (instead of saline or water as was done hitherto) after the method described by Mohler was further studied and found to be successful.

(*vii*) Interesting results were obtained from a preliminary study of the chemical composition of the bacillus of Johne's disease undertaken in collaboration with the Indian Institute of Science, Bangalore.

127. *Tuberculosis and Johne's disease among animals—Imperial Veterinary Research Institute.*—Work could not be commenced on this scheme as the Research Officer, Mr. Lakshmi Sahai, who was due to arrive after training in the United Kingdom in February 1941, has not yet returned owing to the present international situation.

128. *Contagious abortion of cattle, goats and sheep—Imperial Veterinary Research Institute.*—(*i*) The primary object of the scheme is to estimate the extent of contagious abortion in India, and from this estimation to judge whether control measures are (1) economically warranted, (2) economically possible and (3) if found possible and desirable, what form they should take. A field survey of abortion disease must be made to form this estimate.

(*ii*) Much of the preliminary work such as collecting of nucleus of essential apparatus, the organising of office and laboratory and the selection and training of the staff under the scheme, was done by the officer who joined duty at the end of May 1939.

(*iii*) An extensive tour of the infected places was necessary after this. The history sheets of several thousands of animals were examined for evidence of genital abnormality connected with contagious abortion. Several farms were visited and surveyed under the following heads :—

(*a*) (1) Incidence of abortion.

(2) Incidence of premature births.

(3) Incidence of sterility unaccompanied by history of (1) and (2).

(4) Incidence of sterility accompanied by history of (1) and (2).

(*b*) The frequency of appearance of more than one abortion in the same animal.

(*c*) The appearance of abortion in relation to the appearance of pregnancies.

(*d*) The proportion of negative, doubtful, and positive serum reactors in each class shown in (*a*) above and in animals with normal history.

(*e*) The relationship of the serum titre to the time elapsed between the event of abortion and the time of the test.

(*iv*) The routine diagnosis of the disease, previously handled by the Serology Section of the Institute, will be taken over by the special officer. The officer will prepare antigens and instruction for their use or alternatively suitable bacterial strains and standardised control antisers for issue to all Institutes desirous of undertaking work on serological diagnosis.

(*v*) It is very important that a standard routine should be adopted, so that results from all centres may be comparable.

(*vi*) It is also proposed to examine certain aspects of brucellosis in connection with public health and some comparative work on this has already been arranged for.

129. *Helminthic Survey—Imperial Veterinary Research Institute.*—Work was only started in November 1940.

130. *Helminthiasis—Madras.*—Work on this scheme actually commenced at the Madras Veterinary College on 1st June 1939.

(*i*) The complete life-cycle of *Oesophagostomum radiatum* was followed. There are five stages and four ecdyses for this parasite. Methods of culturing

the eggs in the laboratory and the field together with effects of air, moisture, temperature and light on their development were investigated.

(*ii*) Artificial infection of calves with this worm has been successful. The larvæ cause nodules in the small intestine, which are fibrous in the early stages and caseous or calcareous later. Intake of the larvæ may be in single or repeated doses.

(*iii*) Similar experiments are being done regarding *Ascaris vitulorum* and *Moniezia* spp.

131. *Helminthiasis—United Provinces.*—The scheme is due to expire in February 1942. The question of its extension is under consideration.

(*i*) A large number of helminths were collected both by the staff under the scheme and by the provinces concerned. A number of new records of their occurrence were obtained. Further cases of multiple infections amongst the animals examined were detected.

(*ii*) The incidence and intensity of infections on the collection of helminth parasites from slaughter houses at Lucknow have been intensively studied. For this purpose a complete daily survey of one animal of each type, *i.e.* cattle, buffalo, goat and sheep was made.

(*iii*) Materials from a few hæmaturia cases were received from Bengal and examined.

(*iv*) As the work under the scheme considerably increased, the work on the life history problems could not be attended, but now it is proposed to reserve one assistant exclusively for this work.

132. *Nagpur Helminthiasis scheme.*—This scheme is mainly for survey. The work was actually started in September 1940.

133. *Systematic Protozoologist, Imperial Veterinary Research Institute.*—This scheme has now been taken over by the Government of India.

(*i*) The contemplated therapeutic work in connection with bovine theileriasis could not be undertaken until the end of 1939-40 as the strain of theileria parasite maintained at the Institute lost its virulence. The strain has been re-established after a few passages through healthy animals. Six out of 12 animals suffering from the disease recovered after treatment with sulfanilamide. This is encouraging and further tests are being continued. A combination of antiserum and drug will also be tried. The question of specific identity of the parasite is still under study. Experiments made indicate that a considerable amount of time will have to be spent before acute theileriasis can be transmitted. The cause and cure for trypanosomiasis is also being studied.

(*ii*) Comparative efficacy tests in the treatment of surra of two new trypanocidal drugs (Moranyl—A French preparation and Antrypol—a British Drug House product) were taken up. The results so far obtained indicate that both the newel drugs are as effective as Naganol (a German preparation) with the difference that the period required for relapses to take place was prolonged with the former drugs. The stage of the surra parasite in which it must remain in the host and produce relapses after varying intervals is also being studied.

(*iii*) The agents for babesiasis, globidium infection in cattle, *Klossiella muris* infection in laboratory mice, *Crithidia melophagium* infection in the sheep-ked and coccidiosis in poultry are being investigated. It is also proposed to carry out experiments to determine the maximum and minimum ages at which Indian poultry are most susceptible to coccidiosis. In view of the facts

that the existing information on the protozoal fauna of the alimentary tract of animals in India is of a fragmentary nature, a systematic survey has been started, which will have to be carried out over a number of years.

134. *Warble flies—Imperial Veterinary Research Institute.*—This scheme in its present form is due to close by the end of the year 1941 ; but it has been extended in a modified form for dealing with research into the damage caused by ticks to hides and skins and for studying the life history and bionomics of goat warble fly.

(*i*) The results of ox-warble fly surveys carried out in the provinces of Bengal, Madras and Sind, have shown that excessive soil moisture is inimical to the development of *Hypoderma lineatum*. Rearing of adult flies under laboratory conditions was successfully continued. One wild specimen of *H. lineatum* was also captured during March 1940 at Mukteswar. In a number of instances the occurrence of oseophageal form of the larvæ has been noticed to cause hæmorrhage and stenosis of the gullet.

(*ii*) The results of goat warble-fly (*Hypoderma crossii*) surveys so far carried out have shown that the occurrence of *H. crossii* is limited to the N. W. F. P., the Salt Range area of the Punjab, Northern Sind, Baluchistan and Kashmir and Kulu valleys. The breeds of goats infested are characterised by short stature, drooping ears, long hair and long horns. Four goats heavily infested with *H. crossii* larvæ were imported from the N.-W. F. P. and kept under constant observation at Mukteswar. In the case of this species of fly, the pupal period was found to vary from 30 to 40 days, whilst the time taken by the larvæ to mature in back of the goat ranged from 65 to 70 days.

(*iii*) Control of the warbles by two dressing methods, *viz.* (1) tobacco, lime and water and (2) derris powder and water, was also tried.

135. *Control of ticks—Bombay.*—This scheme is due to terminate in 1942 but the question of its extension is under consideration.

(*i*) The work under the scheme was conducted at three cattle dipping tanks and with two spraying machines. Cattle and buffaloes were successfully dipped and spraying operations were conducted with arsenic solution—Cooper's Cattle Dip as well as home made dip. Cooper's Cattle Dip and home made dip when used in their normal strength were quite effective in destroying ticks, lice, swarming buffalo head flies, *Hippobosca maculata* flies and helminths, *Filaria hæmorrhagica* and *Thelazia rhodesia*. It was found that any arsenic solution either home made dip or a proprietary one could not be used in India, in the strength advised in colder countries, all at once while starting the operations newly in a village. It was essential that cattle should in the first instance get accustomed to a dilute arsenic solution just capable of killing ticks. The strength of the solution should then be raised gradually to the normal one and should be adjusted for use in different seasons in different localities depending upon the heat and humidity of the atmosphere prevailing there.

(*ii*) Cultivators showed great interest and enthusiasm at the time of starting the operations but they created trouble and ceased to take further interest in the operations when their animals showed ill effects of arsenic bath. Strangely enough, this attitude was more marked in villages where spraying operations were undertaken on a no-cost basis so far as the villagers were concerned than in those where cattle dipping tanks were constructed partly or wholly at their cost. Dipping system of controlling ticks was more popular and easy of operation than the spraying one. Where dipping operations were carried out cultivators maintained a sustained interest in the operations even in spite of ill effects produced. They agreed to dipping operations of such of

their cattle as were found infested with ticks but required a lot of persuation to have those cattle which were not apparently infested with ticks dipped. The experience gained was indicative of the possibility of controlling tick infestation in a village by dipping the majority of cattle including those infested with ticks. Substantial evidence has been collected to show that cattle dipped regularly put on greater body-weight and grew more than undipped cattle. It has also been observed that dipped animals were less liable to harbour ticks than undipped ones and that stunted growth resulted in undipped animals due to tick infestation.

136. *Inquiry into the indigenous system of veterinary medicines.*—The enquiry was completed and the report of the same published.

137. *Toxicology of indigenous drugs—Madras.*—The scheme started working about the middle of July 1940.

(*i*) The officer-in-charge has obtained from the Veterinary Departments in the provinces and states a list of about 74 plants reported to have toxic effects and 117 plants of therapeutic value. If those on which investigations have been carried out by previous workers are eliminated, about 52 plants (toxic) and about 60 (of therapeutic value) call for investigation.

(*ii*) Research work has been undertaken on *Crinum defixum.* Attempts are being made to treat cases of sterility and to find out an effective remedy for curing cases of follicular mange in canines.

(*iii*) Further work on toxicity and therapeutic properties of a number of drugs will be undertaken in consultation with Col. Sir R. N. Chopra of the School of Tropical Medicine, Calcutta.

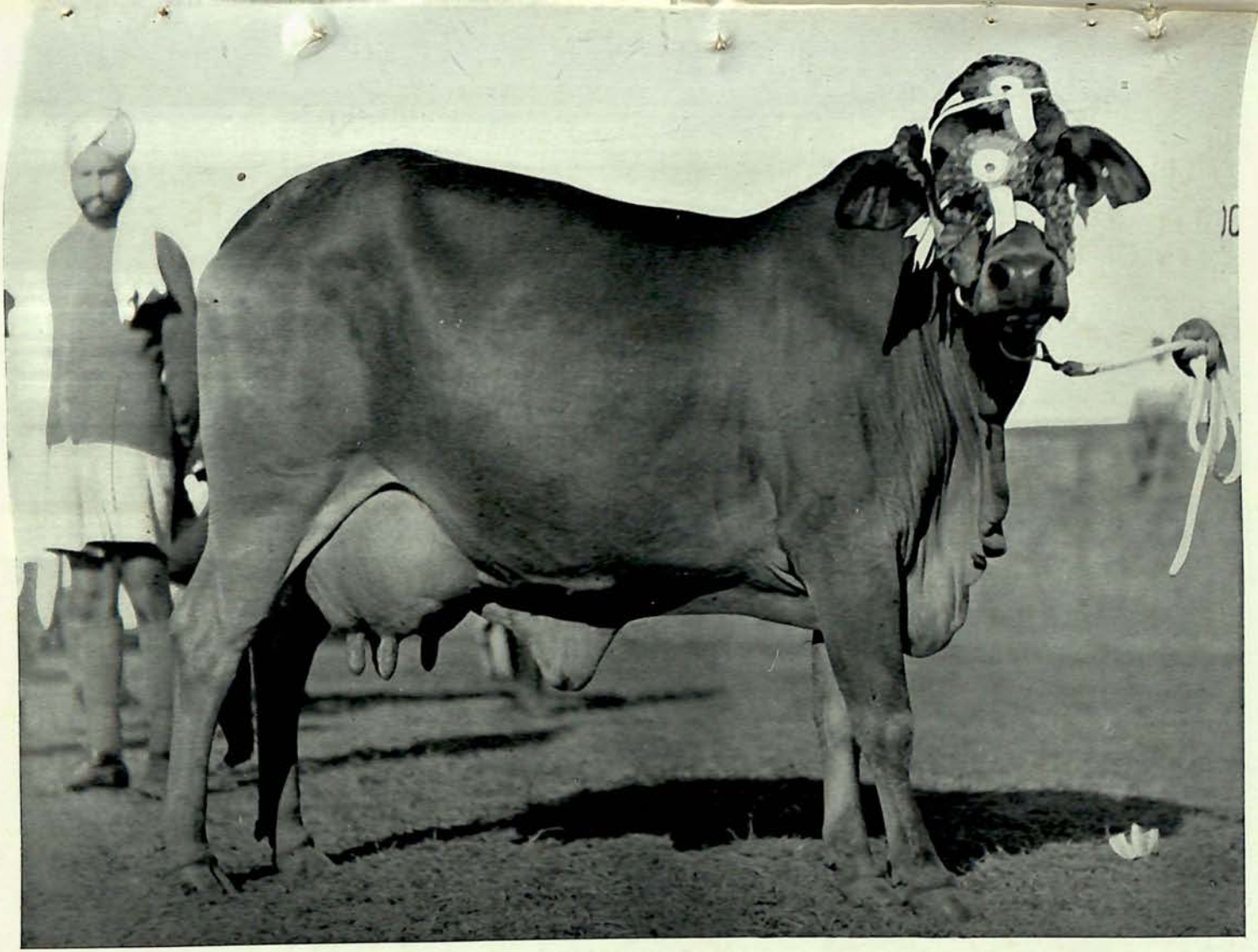
138. *International Veterinary Congress, Zurich and Interlaken, 1938 and Imperial Veterinary Conference, London, August 1938.*—The report submitted by Col. Sir Arthur Olver, the Senior Delegate to the Conferences, was considered by the Advisory Board. The following resolutions of the International Veterinary Congress were endorsed :—

(1) The syllabuses of Veterinary Colleges in India should include, along with preventive and curative medicine and surgery, practical courses in breeding, rearing, feeding and housing of all classes of livestock.

(2) Since the veterinarian from his special training and experience is best able to recognise diseases among animals which are communicable to man, he should be employed wherever practicable for the inspection of animals before and after slaughter and of food products derived from them.

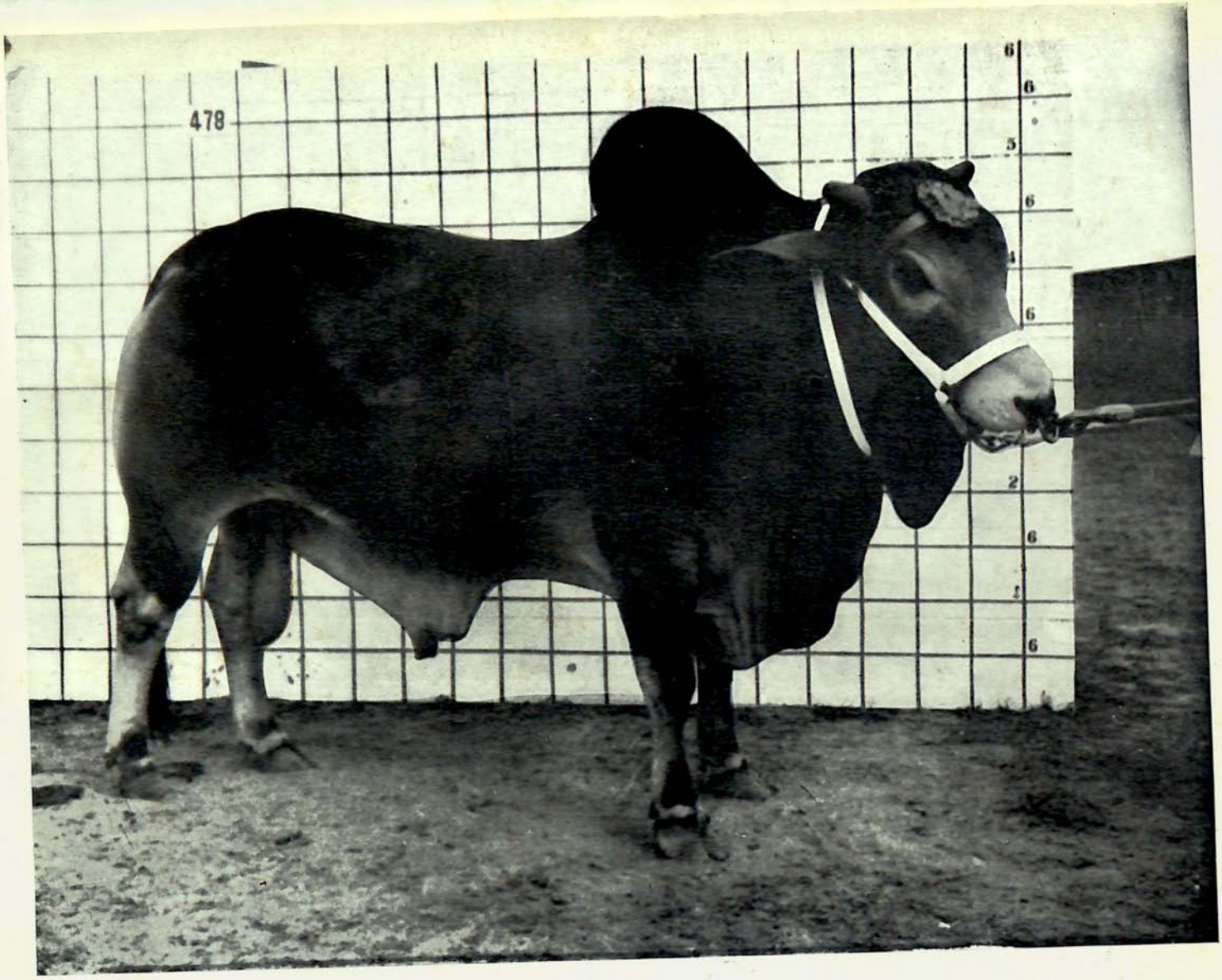
(3) The wide-spread application of the art of correct feeding of livestock is a matter of great urgency. At present any policy aimed at improvement through breeding soon finds itself handicapped and at times completely overshadowed in India by the problems of nutrition. The present policy of producing the greatest possible amount of cash crops requires to be reconsidered so that more attention may be paid to fodder requirements of livestock and the necessity for maintaining fertility in the soil and increasing the supply of milk and other protective foods of animal origin.

(4) Comparatively little work has been done so far in regard to the biological value of feeding stuffs for livestock, including an estimation of minerals, vitamins and amino-acids. Detailed investigation is therefore necessary on this aspect of animal nutritional workers in this country.



Champion of 1941

Mudini, a Sahiwal cow owned by the Military Dairy Farm, Ferozepore, was adjudged to be the best animal in the All-India Cattle Show, and won the Viceroy's Cup in addition to other prizes.



Sahiwal bull

(5) The importance of phosphatic supplements to diets in areas where soil is deficient in this mineral is now well recognised all over the world and investigations (by Livestock Departments) in respect of where such deficiencies occur in India are required.

(6) The immense possibilities of artificial insemination have now been universally recognised and it is essential that fundamental and applied research on the subject should be undertaken in this country with a view to extend the use of the limited number of available suitable sires.

139. *Animal welfare work.*—(*i*) The Advisory Board considered a suggestion that the Veterinary Investigation Staff in the provinces and states should be utilized as the nucleus of an Animal Health Service. They observed that it would be a mistaken view to suggest that because this staff had now been in existence for the last eight or nine years, the survey of diseases in this vast country had been completed and pointed out that these officers had acted as an extremely valuable extension staff for carrying out mass scale goat tissue virus vaccination work against rinderpest and had also discovered or elucidated either independently or in collaboration with the Imperial Veterinary Research Institute a number of little understood conditions, *e.g.* bovine pleuropneumonia, hump-sore, osteomalacia, bovine surra, rinderpest in sheep and goats, pleuropneumonia in goats and parasitic otorrhoea in buffaloes. There were numerous other conditions requiring investigation and with the new arrangements for the co-ordination and scrutiny of their technical programmes, it should be possible in future for the officers to take up more detailed research on certain specific problems.

(*ii*) The Board agreed that as the basis of an Animal Health Service, it was necessary to have a properly equipped livestock research station in every province and major state where the investigation of disease, nutritional and breeding problems could proceed side by side, in the same way as these subjects are investigated on behalf of the plant industry at agricultural research stations. They also pointed out that in several provinces and states, one of the existing cattle farms could be converted immediately into such a station without much expense, and the work at these provincial livestock research stations could be co-ordinated by an existing organisation at the centre. Finally they considered that for extending animal health work in rural areas in provinces and states, it was desirable that the Veterinary Investigation Officers and selected members of provincial and subordinate staff should receive the advanced training in animal health which is now available at the Imperial Veterinary Research Institute, Izatnagar, and the Imperial Agricultural Research Institute, New Delhi.

(*iii*) The Board have also added that the veterinary assistants should be instructed to pay more attention to animal welfare and animal health work in future. The above recommendations of the Board have been communicated to the provinces and constituent states for necessary action.

E. Dairying

140. *Composition of milk, Allahabad Agricultural Institute.*—This scheme which was started in July 1936 was terminated at the end of June 1939. Steps have been taken to have the huge mass of data which has been collected analysed statistically. The results will, it is hoped, be of use for the establishment of standards on which public health legislation to prevent adulteration of milk might be based.

141. *Supply of milk from villages to towns.*—This question was discussed in all its bearings and the following recommendations were made and communicated to provinces and constituent states :—

(*i*) (*a*) The assembling of producers at the central place for milking their cows is necessary.

(*b*) Loans should be given by co-operative societies where necessary for purchase of cattle and they should be repayable in easy instalments by recovery from payments for milk. The amount to be advanced will depend upon local conditions.

(*c*) Loans may also be advanced for purchasing feeds under the same conditions or as an alternative fodder and concentrates might be purchased in bulk at wholesale rates and distributed to producers.

(*ii*) The type of shed will depend upon local conditions. Pucca buildings may not be possible to begin with but the aim should be to provide pucca floors and some shelter against the weather. Sufficient supply of water is essential.

(*iii*) Local arrangements should be made for supervision. Ordinarily a paid officer will not be possible at present. It would however be an advantage if it could be arranged for a member of the provincial Veterinary Department to pay a quarterly visit to collecting centres with a view to giving advice regarding the maintenance of the health of the animals.

(*iv*) (*a*) Whether an assembling station will be necessary, depends upon local conditions, availability of roads and means of transport. As raw milk cannot be guaranteed to remain in good condition for more than two hours, an assembling station will be necessary when its transport takes longer than this. Flash pasteurisation should be carried out at the assembling stations.

(*b*) Collecting centres more than ten miles away from a town have the advantage of avoiding competition with head loads from suburbs.

(*v*) (*a*) Heavily tinned metal cans capable of being locked should be used.

(*b*) No cooling arrangements were considered necessary during transit.

(*c*) If an assembling station is used and the milk heated in any way it should be transmitted in hot state to the distributing station as quickly as possible.

(*vi*) Locking and sealing of milk cans should ordinarily be enough precaution against adulteration, but frequent surprise checks are essential. Gerber's fat test and solids-not-fat content test are generally recommended for use. Lactometer test alone is considered unsatisfactory.

(*vii*) An assembling station is necessary only when the area of milk production and the distance between production and distribution cent es are great, and the quantity of milk dealt with justifies the expenditure. In such cases its functions should be :—

(*a*) Testing of milk brought from producing centre and rejecting adulterated or bad milk. It is recommended that ' rejected ' milk be utilised for butter or ghee making.

(*b*) Straining (if not already done at milking centre) and Flash pasteurisation.

(*c*) Locking and proper sealing of cans before they are despatched to distributing centre.

(*d*) Keeping account of the milk received from different milking centres.

(*e*) Cleaning of tanks.

Apparatus required would be that for the different tests applied and for 'flash pasteurisation'. If assembling and distributing centres are combined in one unit, then a bottling machine (if bottled milk has to be supplied), and a pasteurising plant, are required. To deal with a large quantity of surplus milk cream separators, butter churns, etc. are also necessary.

(*viii*) Some further investigation in regard to methods of transporting milk, particularly as regards the use of open or closed lorries, is required.

(*ix*) When the milk has been pasteurised it should be cooled and kept in cold storage till delivery to customers.

(*x*) The milk should be delivered from sealed containers with taps, or in bottles, at the consumer's door. In large towns, milk depots may also be established, if necessary. Wholesale deliveries can be made in specially locked and sealed containers without taps. Some suggest a cap or hood (over the disc on the bottle) which is tied by a wire and electrically welded, but the extra expense may not be justifiable unless a large quantity of milk is handled. Where milk is distributed from sealed containers having a tap, the seal of the cans should be examined on return of the can to see that no tampering has taken place. Occasional surprise checks should also be carried out and samples taken from the distributing cans should be chemically tested for fat and solids-not-fat content.

(*xi*) In towns where there is demand for cream, butter and ghee, the surplus milk should be passed through separators, and cream, butter and ghee may be prepared. But this introduces the problem of disposing of the separated milk. Most people in this country are, as a rule, averse to making use of it. Curd or *khoa* or Indian sweets may be prepared from separated milk. Where a large quantity of separated milk is left on hand, condensed milk, milk powder, dried milk, etc. may be prepared from it or it may be used for the manufacture of casein.

(*xii*) The time suitable for the different operations will vary in different places and under different conditions. Care should be taken to provide enough time between milking and distribution to enable all intermediate operations to be done. In any particular locality, if one works backwards from the time of distribution of milk one can fix the hours of the different operations including milking of animals, but it is thought by some that there may be difficulty in persuading the villager to milk his animals at any given time. At one of the Allahabad Agricultural Institute stations milking is done at 12 noon and 12 midnight. At another it is done at 4-30 in the morning and 4-30 in the evening. Thus no time table can be drawn up for different operations which would apply to all places.

142. *Milk recording—Madras.*—In the beginning only three cows of the Nellore Milk Supply Union were available for recording both in the morning and evening. Attempts were made to persuade the ryots to form themselves into a co-operative body to breed good cattle and improve the milk yields of their cows. At the end of the year under report the necessary data had been obtained for only twelve cows. In the circumstances, the scheme has, with the consent of the provincial Government, been suspended.

143. *Milk recording—Bombay.*—This scheme is being worked in the Kankrej tract of the Bombay Province. The milk recorder under the scheme was appointed in May 1939. Nine villages in Sanand taluka where the premium bull work has been in progress for the last 15 years were selected. The total number of cows whose milk was tested fortnightly from September 1939 to March 1940 was 157. Out of these cows, 112 were the progeny of premium

bulls. The scheme has proved to be of great value to the provincial pedigree registration scheme already in progress in the Kankrej tract.

144. *Milk recording—United Provinces.*—Uniform records were maintained in respect of the herds in the jails at Lucknow, Rae Bareli, Bareilly and Barabanki, and the Bulandshahr and Gorakhpur Agricultural Schools and at the Cawnpore Agricultural College. Ration scales were computed to reduce the cost of feeding and thereby produce milk and calves at cheap rates. Later on attempts were made to induce private institutions to follow this system. The Milk Recorder also paid visits to the village societies belonging to the Lucknow Co-operative Milk Union to make efforts for introducing a sound system of cattle registration and milk recording among the villagers.

145. *Milk recording—Punjab.*—(*i*) This scheme deals with milk recording work in respect of the three Punjab breeds, namely, (1) Hariana cattle, (2) Sahiwal cattle and (3) Murrah buffaloes. Three recorders were appointed, one for each breed.

(*ii*) Fortnightly records of 120 registered Hariana cows in four villages of the Hariana tract were taken. Owing, however, to some cows not proving good milkers or being sold away by the owners owing to severe famine conditions, the number of cows dwindled down to 82 towards the close of the year. In each village a bull of known performance was selected for covering the registered cows. Its service record as also the breeding record of each cow, registered under the scheme, were maintained side by side with milk records. Cattle breeding and milk recording societies were organised in all the selected villages and fortnightly meetings were held regularly. In all about 60 such meetings were held during the year.

(*iii*) Similarly the milk of 67 Sahiwal cows in four villages of the Sahiwal tract was recorded. Several of these cows were in different stages of lactation. In this case also milk recording was rendered difficult by some of the cows being sold away.

(*iv*) 131 Murrah buffaloes were registered for milk recording in three villages. The number dwindled down to 116 towards the close of the year. The highest amount of milk produced by a Murrah buffalo in her fourth lactation was 9,222 lb. in nine months and 22 days with an average daily yield of 33 lb. A milk recording society was formed in each of the selected villages. Meetings of these societies were held and attended by the milk recorders regularly.

(*v*) The work with the Hariana and Murrah breeds is thus making good progress while in the Sahiwal tract it is not so conspicuously successful, owing to the existence of a similar provincial scheme in the same area. Arrangements have already been made for continuing the work in connection with the Hariana and Murrah breeds by fitting in with it the Herd Book Registration scheme already sanctioned for the Punjab.

146. *Milk recording—Sind.*—This scheme was sanctioned in October 1940 on the lines of similar schemes in other provinces. It is expected to start working in 1941-42.

147. *Detection of adulterants in ghee.*—This scheme was sanctioned in December 1940.

(*i*) Detailed information will be collected about sub-divisions of the volatile fatty acid fraction ;

(*ii*) the unsaturation of the fat and its trend under various conditions will be studied ;

(*iii*) optical data chiefly connected with the characterisation of the ultraviolet fluorescence of fat alone, in various solvents or with reagents capable of enhancing the fluorescence will be collected ;

(*iv*) the inter-relation of various physical with chemical data will be studied.

F. Poultry

148. *Poultry husbandry—Bombay.*—(*i*) Feeding trials on wheat bran mash and lucerne-hay powder mash were carried out and it was found that wheat bran mash is better than lucerne-hay powder mash. It also helps in greater production of eggs.

(*ii*) Again *bajri* grain is better than *nagli*. Hatching percentage was 63 in Monsoon and 41 in winter.

(*iii*) The average egg yield improved to 144 eggs per bird per year as against 138·8 in 1938-39.

(*iv*) Feeding of grain and mash ration gives nearly double the yield of eggs as compared to feeding on grains alone and the former is also more economical for the producer.

(*v*) Cross breeding of Light Sussex with Chittagong were carried out. Egg laying trials are in progress.

149. *Poultry for table purposes—Punjab.*—(*i*) Complete data regarding four indigenous breeds of fowls, *viz.* Asil, Chittagong, Improved Punjab (Brown) and Desi (Mongrel) in respect of egg production ; body weight of breeding stock, broodiness, hatching results, adult and chick mortality and rate of growth of young stock were collected and classified. These showed that Chittagong is the best egg producer with 104 eggs in the year while Asil is the worst. Mongrels have the highest fertility (89·2 per cent) and Chittagong the lowest. Improved Punjab (Brown) is the best breed so far as hatchability of eggs is concerned and gave 93·8 per cent results. Chick mortality was highest among the Chittagong and lowest among the Improved Punjab Brown.

(*ii*) Two pounds live-weight was considered a suitable weight for marketing a tender fowl. Chittagong cockerels attained this weight in 18½ weeks. Fattening trials were carried out with buffaloe's milk in a wheat meal—maize meal mash, in special crates. It was found that whole milk is not economical to use.

150. *Poultry diseases.*—Schemes have recently been sanctioned for the Imperial Veterinary Research Institute and for Madras, Bombay, the United Provinces, the Punjab, the Central Provinces and Berar, Bihar, the North-West Frontier Province, Assam and Hyderabad.

(*i*) The common programme for these schemes includes :—

(*a*) thorough post-mortem examinations and systematic clinical investigations in the affected area and only preliminary microscopic examinations such as may be necessary and possible for field workers to carry out ;

(*b*) the submission of carefully preserved and suitable material to the Imperial Veterinary Research Institute, Mukteswar, and

(*c*) precise records of all clinical data obtained as to the effects of the disease and all possible sources of infection ;

(*ii*) The officers-in-charge of these schemes are required to undergo a training for six months at the Imperial Veterinary Research Institute in disease investigation methods and in poultry management. Where the officer has already undergone the post-graduate course at Mukteswar, the period of training may be less.

G. Pisciculture

151. *Fresh water fishes—Calcutta University.*—This scheme has been in operation since December 1936 :—

(*i*) Observations on the determination of artificial food (pulses) for fingerlings and their effect on the growth of common food fish were made.

(*ii*) In connection with the transport of 'Jeole' fishes, in view of the long distances the stock has to travel before being delivered to the market, the essential things, apart from keeping them alive, is to feed them with artificial food as otherwise the fishes lose weight due to starvation or suffer from diseases due to malnutrition. As there is no definite knowledge of the food of the 'Jeole' fishes attempts were made to remove the difficulty of feeding them during transport by investigating the artificial food suitable for them.

(*iii*) Special attention was paid to the important problems concerning the natural food of fishes and the culture of micro-organisms used as food by the fishes in nature. More emphasis was laid on this side of the problem in view of the importance of developing pisciculture in rural areas on economic lines.

(*iv*) Attention was also devoted to oxegenation of still water for the purpose of rearing eggs in dug-outs or pits in the earth or small tanks which serve as hatcheries.

(*v*) It is economic to clean ponds or aquaria used for rearing fishes as otherwise several diseases, resulting in heavy mortality in fishes, arise.

(*vi*) Further observations were made on sex-dimorphism, cannibalism and diseases in fishes and extensive field observations were carried out on the spawning ground and breeding habits of Indian carps.

(*vii*) An invaluable collection of all stages of fish life was made from rising spawn to hatching so as to illustrate the life history of *Rohu* and *Calbasu* as representative of the Indian carps.

152. *Rural pisciculture—Madras.*—This scheme was sanctioned in December 1940. It aims at assisting the ryots in growing fish in their ponds and wells. The work will include :—

(*i*) The study and selection of the best kinds of fish for tank and well stocking in rural areas.

(*ii*) The artificial breeding of the most important class of fish for small tank and well culture.

(*iii*) The ascertaining of the best and cheapest methods for the transport of live fry to tanks and wells by special tin carriers.

(*iv*) Intensive study of fresh water micro-fauna and flora of ponds and wells and the selection of those that form the food of fish.

(*v*) A study of the effect of different fresh-water weeds, snails, shrimps and insects on fish under culture.

(*vi*) The ascertainment of the value of different classes of artificial food in promoting growth and fattening of fish for the market.

(*vii*) The examination of hydrographical conditions in fish ponds and wells.

(*viii*) Experiments in the destruction of predaceous fish with poison or electricity.

(*ix*) The study of diseases of fish under culture.

153. *Cod liver oil substitutes.*—The question of producing a fish liver oil containing vitamins A and D to satisfy the demands of both the military and medical departments was considered. It was observed in this connection that the present very limited supply of oil of very high potency extracted from the livers of sharks and saw-fishes in the two fish curing yards of the Madras Fishery Department could be augmented provided a proper organisation was set up to work along the entire coast line of India. For the purpose of working such an organisation it is necessary to have (*i*) money to make cash payments to fishermen, (*ii*) trained staff for the collection, extraction and refinement of oil and (*iii*) an ample supply of new kerosene tins. As the whole problem is largely an industrial or commercial one the matter has been referred to the proper authorities for further necessary action.

H.—Wool

154. *Carpet wool.*—The Wool Committee observed that at present there is some lack of cohesion between the producer and the industrialist with the result that in some places attempts are being made to evolve a type of wool which is not in the greatest demand by the local traders. The first essential was a survey of the sheep population throughout India with a view to define the characteristics of the different breeds of sheep and to evaluate their potentialities as wool producers. After the characteristics of each breed have been defined, work should commence with a view to obtain uniformity within each breed and development should be attempted in accordance with the trade requirements in different parts of the country. The suggested survey might be carried out by the officer-in-charge of the wool research station when it is established.

155. *Low production.*—The Wool Committee observed that disease and malnutrition were responsible for poor quality as well as low production of wool. Other agents causing depreciation in the value of wool were burrs and spear grass. Most of the diseases caused by external and internal parasites could be effectively controlled by regular dipping and drenching. These remarks have been communicated to the provincial Governments and constituent states for information and necessary action.

156. *Danger of anthrax.*—It has been pointed out to provinces and constituent states that the opening of carcasses of animals infected with anthrax is likely to spread infection dangerous to human life and such action would *prima facie* fall within the mischief of section 269 and 270 of the Indian Penal Code.

157. *Wool production.*—The Wool Committee recommended that the type of work already in progress at the sheep breeding farms in the Bombay Province on washing, shearing, sorting etc., of wool and the co-ordination of it with carding, combing, spinning, etc., should be extended to other sheep breeding stations in India and carried to the villages through subsidiary stations. This recommendation has been communicated to the Governments concerned.

158. *Census.*—As a first step towards the inclusion of sheep in the live-stock census particularly with a view to distinguish between woolly sheep and hairy sheep the Wool Committee desired that enquiries might be made from provinces and states to ascertain the various local names by which the different hairy and woolly sheep are known. The necessary information is being collected.

159. *Sheep show.*—The Wool Committee observed that it was desirable to include classes for sheep not only at the All-India Cattle Show at New Delhi and its regional branches, if and when these were introduced, but also in local shows in provinces and states. There are, however, a number of practical difficulties, of which the question of financing the exhibits is not the least important. The importance of stud books and score cards for sheep as are in vogue in other countries is realised but the Committee felt that at the present stage it was premature to introduce these in India except on organised farms where controlled breeding was in progress. These recommendations have been communicated to the provinces and states and the All-India Cattle Show Committee for information and necessary action.

160. *Wool analysis, Bombay University.*—This scheme was sanctioned in July 1939, and the work under the scheme was started in August 1940. The various physical characteristics of wool fibres, *viz.* length, diameter, crimp, kemp and density obtained from various parts of India will be investigated under the scheme in order to assess the quality of wool. Instructions for the despatch of wool to this centre have been issued to the officers-in-charge of the Council's sheep breeding schemes. Other officials and non-officials doing sheep breeding work and desiring to get their samples analysed have also been similarly instructed.

I.—Animal Industry

161. *Animal Husbandry Bureau.*—The Bureau was started in April 1934. Its term expires in April 1942 and the question of its extension is under consideration :—

(*i*) The second volume of Milk Records containing about 5,000 records was seen through the press and the preparation of the third volume was taken in hand.

(*ii*) The Village Milk Recording schemes financed by the Council in the Punjab, the United Provinces, and Bombay were inspected by the officer-in-charge of the Bureau during the year, and proposals were submitted for the development of the work and for its extension on a larger scale.

(*iii*) A number of Co-operative Milk Societies were visited by him with a view, *inter alia*, to examine how such institutions can be utilised for the promotion of milk recording.

(*iv*) An investigation on a large scale regarding the relative reliabilities of different methods of milk recording was taken up and nearly completed. The results will be published in due course.

(*v*) A scheme was prepared for the replacement of fortnightly milk recording by a system of single tests conducted at peak of lactation. This is being given a trial, and if successful will go a long way in extending milk recording and in cheapening the cost of recording.

(*vi*) Proposals for the establishment of Herd Books for the Sahiwal, Sindhi and Hariana breeds of cattle and Murrah breed of buffaloes were approved by the Advisory Board during the year. The necessary forms required for the maintenance of Central Herd Books are being printed at present provincial Governments have been requested to co-operate in the matter and the registration of animals will be taken in hand as soon as the printed forms become available.

(*vii*) Definitions of breed characteristics of Nili, Ravi, Surti, Tharparkar and Dhanni breeds received from the provinces were collated.

(*viii*) Material was put into shape for the publication of a bulletin containing a brief description of those breeds of cattle not dealt with in Miscellaneous Bulletin No. 17 of the Council. Miscellaneous Bulletin No. 46, containing photographs with brief descriptions of winners at the Second and Third All-India Cattle Shows, was prepared and published.

(*ix*) A comprehensive note on the development of livestock shows and exhibitions was prepared and submitted to the Animal Husbandry Wing meeting held at Izatnagar.

(*x*) As usual a stall was put up at the All-India Cattle Show where various charts of importance were exhibited, sales of publications were organised, and standard photographs of prize winners were arranged.

162. *Export trade in cattle.*—Enquiries regarding the supply of pedigree cattle were received from the United States of America, the Persian Gulf, Afghanistan, Tanganyika, Kenya and Mexico. Where required, arrangements were also made for the supply of cattle. The question of publishing a popular booklet for use in foreign countries by importers of Indian cattle is at present under the consideration of the Council.

163. *Mention of animal industry in provincial reports.*—(*i*) In the Council's review " Agriculture and Animal Husbandry in India ", a chapter is devoted to Animal Industry and considerable difficulty was experienced in the past in obtaining the requisite material for making this section of real interest to the public. Besides, it is desirable at the present time to pay more attention to the different livestock industries of this country. The outbreak of war has naturally resulted in a greater demand for certain livestock products,

such as leather and wool, and with the sea transport difficulties which still exist, it is very desirable that India should take the opportunity of developing to the fullest extent possible not only those indigenous livestock products which are required for export but also those consumed in the country.

(*ii*) With this end in view the provinces and states have been requested to devote, as has been done in the veterinary reports of many colonies, a section in the annual report of the appropriate department supplying detailed information in regard to the industries named in the list below, particularly their rise or fall in the province as a whole, the influence on them of contagious diseases, other reasons for fluctuation, and steps taken for improvement :—

(*a*) Trade in live animals, both inland and for export.

(*b*) Production of hides and skins.

(*c*) Sheep rearing for wool and mutton.

(*d*) Goat rearing for milk and mutton.

(*e*) Poultry keeping for eggs and table purposes.

(*f*) Horse and camel breeding in the provinces and states where these industries exist.

(*g*) Other livestock industries, *e.g.* pig rearing.

(*iii*) The subject of cattle breeding has been left out from the above as it is being dealt with in sufficient detail in the relevant reports and will, it is hoped, continue to receive the same attention in future.

J.—The Animal Husbandry Wing Meeting

164. *General.*—The fourth meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India was held at the Imperial Veterinary Research Institute, Izatnagar (Bareilly) from the 18th to the 20th December 1940. His Excellency Sir Maurice Hallet, the Governor of the United Provinces, was graciously pleased to open the proceedings. About 75 members from all parts of India participated in the proceedings. The agenda for the meeting included 15 subjects covering a large field and many useful suggestions emerged from the deliberations.

165. *Propaganda or dissemination amongst rural population of information regarding the management of different kinds of livestock.*—The Wing reviewed the present methods of disseminating amongst rural population information regarding the management of different kinds of livestock. It is proposed to place the various suggestions made in the meeting in this connection before the Livestock Committee and the Advisory Board of the Imperial Council of Agricultural Research so as to formulate definite recommendation for the consideration of the provinces and states.

166. *Mastitis in dairy herds.*—The Wing reviewed the methods for the diagnosis and control of this disease and considered that systematic work on the control of the disease which causes diminution in the amount of milk produced and also affects the quality of milk should be started. The necessary investigations have already been taken up by the Imperial Veterinary Research Institute.

167. *Cattle shows and cattle fairs.*—The Wing reviewed the present position regarding cattle shows and cattle fairs conducted in provinces and states and considered measures for (*a*) developing this side of local activity with a view to provide the maximum stimulus for cattle improvement,

(*b*) correlating these local shows with the All-India Cattle Show and (*c*) introducing the card system of judging with a view to obtaining uniformity in this matter. The meeting recommended that in view of the importance of an organised system of shows as a factor in cattle improvement, a Committee set up to make proposals for establishing a system of shows in this country. The Committee will enquire into and make recommendations in regard to—

(*i*) General policy to be adopted,

(*ii*) Finance,

(*iii*) Organisation,

(*iv*) Location of various classes of shows, and

(*v*) System of judging and award.

The recommendation will be placed before the Livestock Committee of the Council for its suggestions and remarks.

168. *Rinderpest.*—Various methods adopted in India in immunising animals against this disease were reviewed. The Wing did not make any recommendation.

169. *Chemotherapeutic resources of India in the field of veterinary zoology.*—(*i*) These resources have not been exploited in this country to any considerable extent and foreign, in many cases German, preparations obtainable at enormous cost had to be relied upon for the treatment of many conditions affecting domestic animals. Owing to war, India is in a favourable position now to take up the manufacture of some of these drugs.

(*ii*) The Wing endorsed the following suggestions in this connection :—

(*a*) In order that the fullest advantage be taken of the available sources, a closer co-operation between research institutes and manufacturing firms should be arranged for. Research institutes are well fitted to indicate the promising " lines " (things that are likely to be useful and of wide application) to firms, and to advise them upon the nature and extent of requirements in each direction. A rational planning and co-ordination of activities would thus result.

(*b*) The Imperial Veterinary Research Institute should undertake on behalf of the firms comparative clinical trials of promising parasiticidal drugs and synthetics manufactured by them, and determine the M. L. D. and the chemotherapeutic index. Firms may freely draw upon the results obtained by this and other research institutes. For this financial assistance may have to be given to the Imperial Institute. This work should be taken up in co-operation with the Agricultural, Medical and Forest Departments.

(*c*) The possibilities of devising control measures against internal and external parasites with the help of selected Indian medicinal plants and their derivatives should be investigated.

(*d*) The agricultural farms of the Institute may start an experimental medicine farm, and attempts may be made to explore the possibilities of cultivating important drug plants of Indian and foreign origin under such suitable conditions as exist in the Himalayan sub-range at Mukteswar and in the plains at Izatnagar.

(*iii*) The present time is opportune for making India a hive of activity in all directions, and the improvement planned and achieved will undoubtedly

be to the benefit of every body concerned. The area taken up by drug plants would be very small and the Agriculture Departments are interested in increasing the outturn of crops which would mean the releasing of some land for other types of cultivation.

(*iv*) A list of drugs required at the Imperial Veterinary Research Institute has since been prepared. As most of these are forest products, the Forest Research Institute, Dehra Dun, who are understood to have many of these on their programme, have been requested to take up the question of introducing them. Firms interested in these are also being kept informed of the matter so that they can look upon it as a business proposition. The Council has already taken up the question of development of Ipecacuanha.

170. *Village enquiry regarding the production and consumption of milk.*—The Wing examined the action taken by the provinces, etc., on the recommendations of the Advisory Board in connection with the Council's village enquiry regarding the production and consumption of milk in seven breeding tracts of India and discussed the different methods of milk recording and the development of the work. It was agreed that for the present fortnightly recording of milk should continue and this question might be reconsidered later. The question of recording being limited to peak yield should be examined in greater detail and the feasibility of its introduction investigated. The recommendations have been noted by the Animal Husbandry Bureau of the Council for necessary action.

171. *Helminthic infection in sheep and goats.*—The Wing reviewed recent advances in our knowledge of the important helminthic infection in sheep and goats. No recommendations were, however, made.

172. *Mass improvement of village stock where recognised breeds of cattle do not exist.*—This subject also evoked considerable discussion and the Wing recommended that the best plan for effecting mass improvement was by putting out better bulls and grading up. The persons conducting propaganda in such areas should be competent, should mix freely with the villagers to gain their confidence and create interest. Continuity of policy and effort was also essential for success. Work must be carried out in a systematic way for a number of years and when undertaken, must result in economic gain to cultivators. In some areas breeding might be allowed only from approved cows and other cows might be segregated and not allowed to breed. Soil deficiency or excess of certain elements in the soil required more investigation, as such deficiency or excess might be responsible for good breeds in some areas and non-descript ones in others. If proper feeding could be arranged it might be possible to make areas with non-descript cattle good for breeding.

173. *Sterility in cattle with special reference to the incidence of Bang's disease.*—A review was made of the causes for sterility in cattle in India with special reference to the incidence of Bang's disease and it was agreed that the special officer for contagious abortion at the Imperial Veterinary Research Institute, should draw up, in consultation with the provincial Directors of Veterinary Services, standard methods to be adopted by their staff when making *ante mortem* examinations in cases of sterility and a standard form on which returns can be made from Government farms and others. The proposals should then be placed before an appropriate committee and the Advisory Board of the Council for their consideration. The special officer has since been asked to take action accordingly.

174. *Nasal schistosomiasis.*—The Wing considered the most practical methods of controlling this disease in India but did not make any recommendations.

175. *Sheep breeding and management and formulation of a breeding policy for the future.*—The Wing reviewed the results so far obtained in sheep breeding and sheep management in India with a view to the formulation of a breeding policy for the future. It endorsed the recommendations of the Wool Committee of the Council that the first essential was a survey of the sheep population throughout India by a senior officer from the contre, in collaboration with local officers in the various provinces and states, with a view to define the characteristics of the different breeds of sheep and to evaluate their potentialities as wool producers. After the characteristics of each breed have been so defined, work should commence with a view to obtain uniformity within each breed and development should then be attempted in accordance with the trade requirements in different parts of the country. The question of development of each breed according to trade requirements will have to be taken up by the provincial or state departments concerned, but the contemplated Central Wool Research Station will help in matters relating to histology, nutrition, genetics and technology. It will be the duty of the officer-in-charge of the station to carry out the proposed survey of the various breeds of Indian sheep.

176. *Biological factors affecting the value of hides and skins.*—(*i*) The control of biological factors affecting the value of hides and skins in India was discussed. The author of the note, submitted to the Wing in this connection, had made the following suggestions :—

(*a*) The possibility of growing derris plant in Northern India and of introducing the American plant known as cube should be investigated.

(*b*) Experiments should be undertaken to determine the possible nature of the damage caused by minor factors.

(*c*) Possibility of dipping on a large scale should be considered with due regard to the habits of ticks.

(*d*) Ways and means should be devised to destroy the eggs laid by the warble fly.

(*e*) The possibility of introducing elgislation to make it imperative on the part of stock owners to dress their livestock during the warble season should be examined.

(*ii*) The Wing did not make any recommendation but the Chairman promised that the above suggestions would be placed before the Hides and Skins Committee of the Imperial Council of Agricultural Research.

177. *Fodder poisoning of stock and the use in times of famine of fodders not usually fed to stock.*—The Wing examined the available information on the subject and recommended that work on famine fodders and fodder poisoning should be continued at Mukteswar and other places. The recommendation has been brought to the notice of the Imperial Veterinary Research Institute and the provincial Governments.

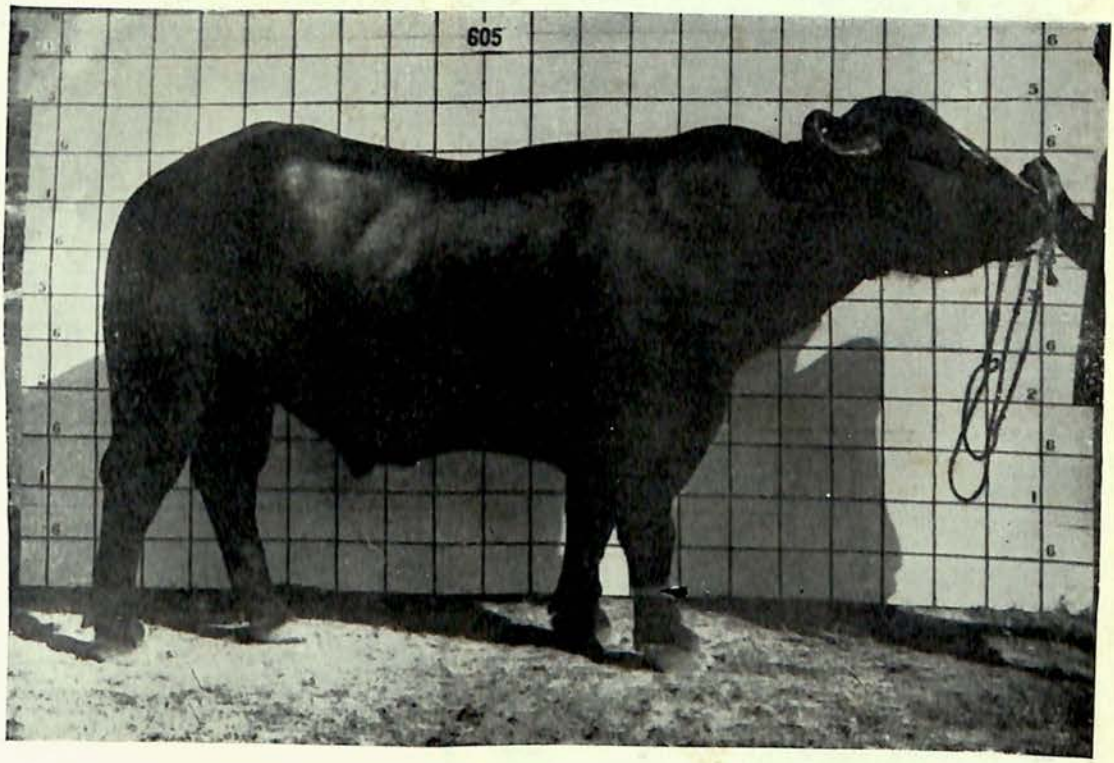
178. *Poultry husbandry.*—The scientific aspects of poultry husbandry in India with special reference to feeding, breeding and housing was also discussed. No recommendations were, however, made.

179. *Legislation for disease control.*—(*i*) The Wing considered the question of introduction of measures for effective disease control in provinces and states which would also satisfy the international requirements regarding the certification of animal products for export. A model bill for the purpose was drafted by the Secretariat of the Council and circulated to the Wing.

(*ii*) The Wing passed unanimously the following resolution in this connection :—

> " That in the opinion of this Conference steps should be taken in those provinces and states in which such legislation does not already exist to introduce an enabling Act for the control of the contagious diseases of animals, on the lines of the draft model bill circulated with the note on Item No. 15 of the Agenda for this meeting, with such modifications as may be found necessary ".

(*iii*) The resolution was communicated by the Council to the Government of India who transmitted it to the provinces and states indicating at the same time the importance of implementing it.



Murrah buffalo bull

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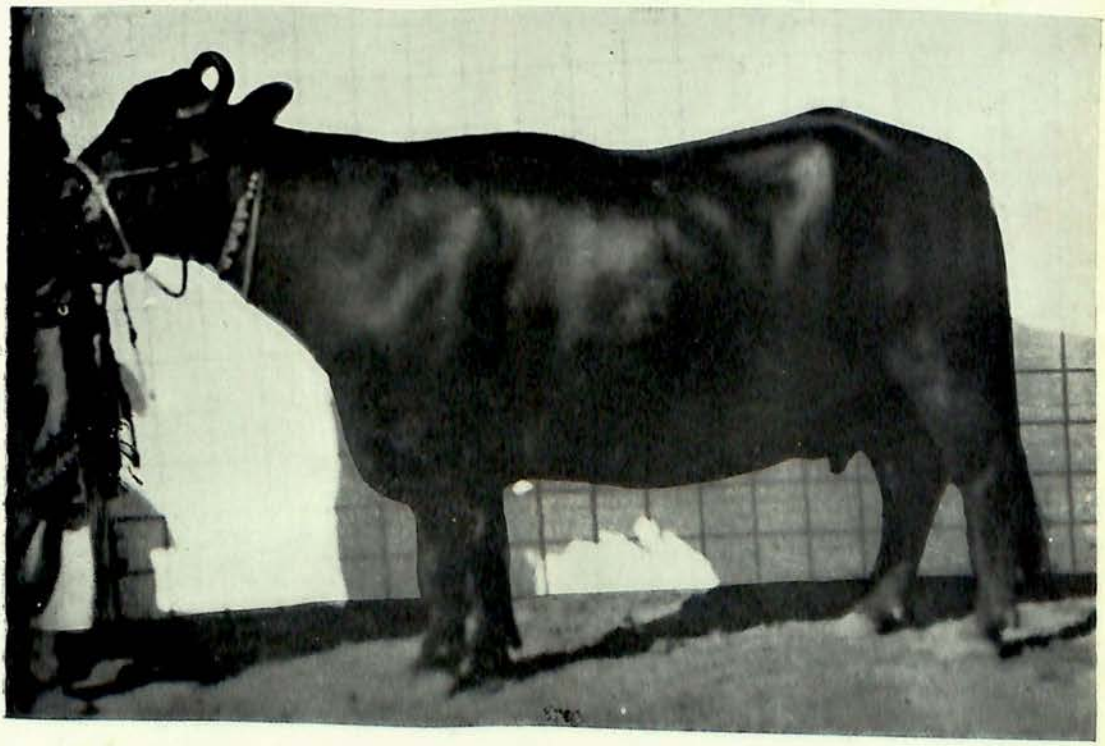
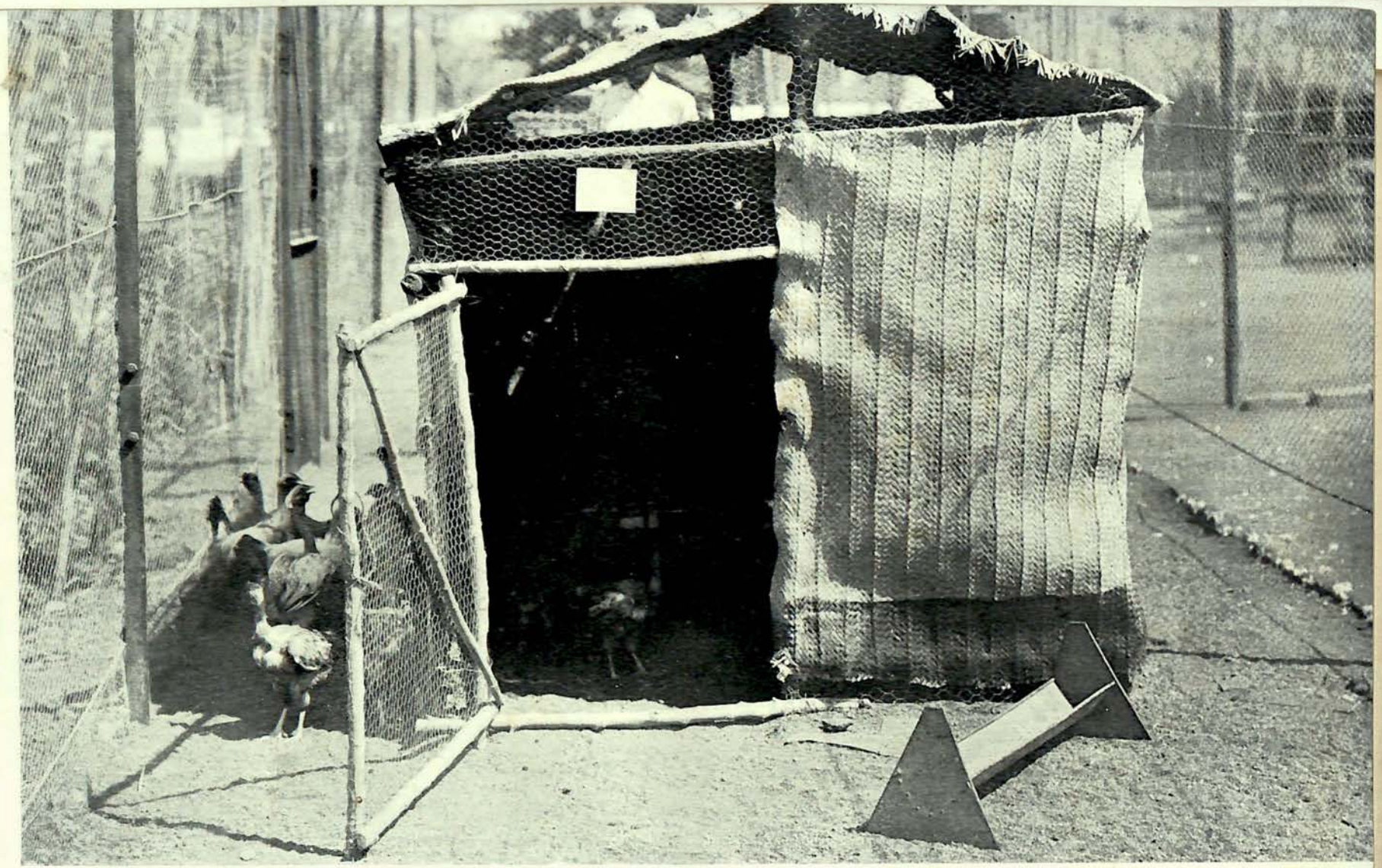
Murrah buffalo cow





Palm leaf matting house for poultry — Cost Rs. 7/-

CHAPTER IV—COMBINED AGRICULTURE AND ANIMAL HUSBANDRY

A.—Development

180. *Projects.*—Sir John Russell attached great importance to developmental work being undertaken by the Council to bridge the gap between the research stations and the cultivators. The question has been discussed many times. As a result of some of these discussions, provinces and states have been invited to put up proposals for the establishment of ' projects '. The main idea underlying a ' project ' is to ' put across ' a whole group of tested improvements simultaneously and to observe the combined effect of all these on the cultivator's income and on the land. It implies the use of the best seed available, the adoption of the best methods of cultivation, rotation, manuring, irrigation, drainage, protection against depredations by animals. preventive and curative measures against diseases and pests, improvement of livestock, improvement in the methods of disposal of the farm-produce and the like. To be successful, both technically and economically, a project should be carried out on a big area, preferably a whole village. The project, it will be noted, differs from demonstration system which was usually confined to one item and was carried out by the Government staff. A project is worked by the cultivator himself under official advice and assistance. A popular article entitled " The Project System Bridges the Gap " by W. Burns, published in *Indian Farming*, March 1941, may be read in this connection.

181. *Mixed farming.*—The Board had recommended a model scheme for mixed farming research. Four such schemes (one each in the United Provinces, Central Provinces and Berar, North-West Frontier Province and Sind) have been sanctioned. The main idea behind these schemes is to introduce the keeping of milk or other animals on certain holdings with the object of feeding the animals from the holding, increasing the fertility of the land from the farm yard manure obtained, and enriching the cultivator by the sale of the milk and milk products and other animal products or young stock. Holdings on which this will be done will be compared in all respects with similar holdings not so treated.

B.—Fodder and Grazing

182. *Grassland improvement (General).*—The fourth meeting of the Central Fodder and Grazing Committee was held in June 1940. The Committee considered the general question of fodder and grazing research with a view to define objectives, to ensure co-ordination and avoid duplication and to obtain results of value.

(*i*) It classified the problems under three heads, production, nutrition and economics and held that research on any one aspect would not be complete unless the other two aspects of the problem were also tackled.

(*ii*) The recommendations in respect of production are that :—

(1) Future work on cultivated fodders which should be carried out both at agricultural stations and cattle farms should be on a standard pattern of experiments and to insure uniformity the Statistician to the Council should send out a standard model for these trials.

(2) In the absence of an agrostologist work on breeding could not be proceeded with satisfactorily and should therefore be omitted from the programmes for the present. But the other work particularly grassland management may be proceeded with.

(3) Work designed to increase the proportion of good grasses for grazing lands might be undertaken and since the replacement of one grass by another by means of reseeding was not feasible, the sowing of the additional seed of good grasses as a part of management should be tried where feasible. The causes of poor germination should be simultaneously studied and the question of weeding should also be looked into. Attention should first be concentrated on the growing and production side and the breeding work should better be left out for the present.

(4) In the case of tree fodders and natural grasses whose nutritional value was not known, the nutritional aspect should be studied simultaneously with cultivation experiments.

(5) The question of certain areas of grassland harbouring parasites, etc., with consequent effect on animals grazing on them should be studied, particularly in wet areas, and experiments should be carried out only in those areas where the problem occurred. It should preferably be undertaken in connection with management schemes in collaboration with a parasitologist.

(6) Grassland improvement by means of management should be pushed on. Schemes on this should indicate provisions for—

(*a*) control of grazing animals; *viz.* number and nature of animals and the provision of salt, water, shade, etc.;

(*b*) control of grazing areas by dividing them into blocks which should be provided with fencing or its equivalent for schemes outside reserved forests;

(*c*) time and period of closing and opening of each block;

(*d*) anti-erosion measures, *e.g.* bunding, contour ploughing, etc.

(*e*) reseeding;

(*f*) alternation of cutting and grazing;

(*g*) burning;

(*h*) dung-spreading.

(*a*) to (*d*) should be obligatory in all schemes and (*e*) to (*h*) may be included wherever desirable.

(7) Work on the utilization of grasses produced as grazing, as hay and as silage and where possible as artificially dried grass, should normally be taken up.

(8) In improving grazing lands three types of lands have to be dealt with, *viz.* (*a*) assembling places (*i.e.*, near stamping grounds), (*b*) land classified as waste adjoining villages and (*c*) forest grazing areas.

(*a*) With regard to assembling places in villages little effective work could be done due to overcrowding except in clearing out unproductive shrubs and planting trees wherever feasible.

(*b*) Regarding lands classified as waste some form of control was necessary and that should be included in the scheme as part of developmental work. Government should take steps to introduce controlled grazing in these areas. In cases where such lands belonged to Government and were leased to other agencies such as special co-operative cattle breeding

societies or *gowshalas*, it should be a condition of the lease that rotational grazing and the provision of silage should be attended to by the lessee.

(*c*) Grazing lands in forest areas should be improved and grazing thereon should be properly controlled. Though they only touched a small cattle population full use should be made of them as demonstration areas for grassland management combined with stock raising.

(*iii*) In respect of nutrition, it was recommended that—

(1) Chemical analysis of fodders and soils which should be carried out by agricultural chemists should be taken up if and when desirable in connection with feeding experiments. Military Farm authorities should be requested to send the chemical data available with them to the Council in the form of an article for publication in its journals.

(2) Biological analysis should be undertaken in specially equipped laboratories and should be undertaken where conditions permitted.

(3) Digestibility trials should be undertaken in properly equipped nutrition stalls and laboratories in the case of those fodders whose feeding values are not known. It was not necessary to restrict this work to the four stations only where this work was being carried out at present.

(*iv*) The recommendations in respect of economics were that :—

(1) In regard to cultivated fodders economics of labour, manures, etc., should be worked out.

(2) As regards grass this should be included in the extension work.

(*v*) The Committee also recommended that work on all the items need not be undertaken at any one centre but fundamental work may be done at one or two selected centres, the more ordinary trials and the application of fundamental knowledge being carried out at a wider range of stations.

183. *Grasslands improvement—Bombay.*—This scheme has been sanctioned recently. The items of work in it are as follows :—

(*i*) To determine the best period of closure and grazing which will give the highest yield, longest duration of grazing and which will increase the carrying capacity.

(*ii*) To determine the minimum number of acres required per animal under different intensities of rainfall to provide sufficient feed during a season.

(*iii*) To classify the different types of grasses in relation to soil and rainfall conditions and to determine the effect of rotational grazing on them.

(*iv*) To develop anti-erosion measures such as bunding, contour ploughing, etc.

184. *Grassland improvement—United Provinces.*—This scheme has also been recently sanctioned and deals with agrostological studies, the improvement of *usar* lands both under irrigated and non-irrigated conditions and the improvement of ravine grass and grazing areas.

C. Statistics

182. *Statistical Laboratory, Calcutta University.*—(*i*) Enquiries relating to the application of statistical methods to agricultural investigations were attended to from all over India. These covered a wide range of topics such as field trials, plant physiology, bacterial counts, entomology and control of pests, experiments on grassland, vernalization, animal nutrition, forest research, work on cultivator's fields, crop-cutting experiments, sample survey of acreage under crops, etc.

(*ii*) Special courses of training in statistics were given to agricultural and other officers who were sent on deputation for this purpose by various provincial Governments, Indian States, universities and scientific institutions from all over India.

(*iii*) Theoretical work was taken up on four topics :—

(*a*) Systematic researches were carried out in the theory of samples drawn from multivariate correlated populations. Sampling distribution on the null (or equal dispersion) hypothesis of a set of p-statistics, which form the appropriate measure of the divergence in the case of multivariate problems. The case of heterogenous dispersion was also investigated.

(*b*) Important contributions were made to the mathematical theory of the design of experiments. A comprehensive paper on Balanced Incomplete Block Designs was published in the *Annals of Eugenics*, Volume 9, part 4, in which all known solutions previously given by Fisher and Yates were obtained by a unified method and new solutions have also been stated. The solution to the problem of ' confounding ' in the general case of s^n design (wherein is a prime or power of a prime) was supplied for the first time from the Statistical Laboratory by using the properties of the s-sided hyper-Græco-Latin squares. Important work was done in supplying, with the help of the theory of Galois fields, a proof for Euler's conjecture that completely orthogonalized sets of s-sided Latin squares can be found so long as s was a prime number or power of a prime. Systematic methods of construction of such squares, which are of great importance in the practical designing of experiments, were also investigated. Other work was also done in the same subject which covered a wide variety of topics such as partially balanced incomplete Latin squares, balanced incomplete blocks in which the number of plots is not constant, hyper-Græco-Latin squares of non-Galois type, the testing of significance in certain types of non-orthogonal designs and other cases of non-orthogonality.

(*c*) A good deal of work was done in developing the theory and technique of sample surveys. The mathematical theory is based on the joint use of two important functions, namely, the variance (or error) function and the cost function. The object of this method is to determine the optimum size of individual sampling units, their optimum number, and the best method of distributing them in order to secure results of the highest precision at any assigned level of expenditure, or alternatively, to determine the

best size, number and distribution of sampling units required to attain any assigned degree of accuracy in the final results at a minimum cost.

(*d*) With the help of a special grant from the Council, work has been started on the construction of tables of ten per cent and five per cent points of the D^2-statistic in the 'Studentized' form. Considerable progress has been made in the preparation of certain auxiliary tables, and much saving of time has been effected by devising suitable reduction formulæ for the incomplete integral of the distributions. Eight numerical tables for use in various applied statistical problems have been issued.

186. *Statistical Section of the Council.*—(*i*) The normal activities of the Section, *viz.* the statistical examination of technical programmes and progress reports of schemes financed by the Council were continued. As usual a large number of workers both under the Council's schemes and outside availed themselves of the services of the Statistician in the planning of experiments and their analyses and interpretation.

(*ii*) At the request of the Government of Bombay the Statistical Assistant, Mr. Iyer, gave a series of ten lectures on 'Statistical Methods applied to Agriculture, to the officers of the provincial Department of Agriculture. Two officers from the Punjab Department of Agriculture also availed themselves of the services of the Section by attending a short course of training.

(*iii*) An important feature of the year was the expansion of the scope of the activities of the Statistical Section to cover the examination of technical programmes and progress reports and statistical analysis of the material collected in the animal husbandry schemes financed by the Council. The staff temporarily added, for carrying out this side of work consist of a Statistical Assistant and a computer. Apart from the day to day advisory duties connected with the examination of the technical programmes and progress reports of animal husbandry schemes, this unit of the Section is now engaged in analysing the material collected under the Council's Milk Composition Scheme at Allahabad.

(*iv*) Equally, the scope of work was expanded on the crop and fruit side to cover applied research. A method was developed for examining the economic aspect of manuring which would permit of a table or graph or both being prepared to indicate if it would pay to manure a crop at given prices for produce and for manure. The method was used to examine whether the application of groundnut cake pays for its price in raising the yield of paddy and a paper embodying the results was published. The economics of manuring of other crops is being simliarly examined. Another important statistical study in hand relates to the individual apple tree, records at Chaubattia to investigate the distribution of fruit yield and size and shape of plot for field-experimentation.

(*v*) A note on the methods of combining the yield of grain and straw in cereals for comparing the total economic return of one variety with another was prepared and circulated for the use of the agricultural research workers on the recommendation of the Advisory Board.

(*vi*) The following papers were published during the year :—

(*a*) A supplementary note on the anlysis of 3^3 and 3^4 design by S. S. Iyer (*Ind. J. Agric. Sci.* Volume X, part IV.)

(*b*) Economics of Manuring by Dr. P. V. Sukhatme (*Current Science*, Volume X, No. 4.)

CHAPTER V—GENERAL

A. Library

187. *Work of Library.*—The Library is run at present as a five-year scheme from the research funds of the Council.

(*i*) During the year under review the Library was shifted from the Imperial Record Building to the North Block of the Imperial Secretariat Buildings. It is now occupying rooms in the same wing in which the main office of the Imperial Council of Agricultural Research is located.

(*ii*) The Library has progressed steadily from year to year and at present it has on its shelves 21,560 books, about 15,500 bulletins, memoirs, pamphlets, etc., and more than 600 translations of foreign papers, all dealing with agriculture, animal husbandry and cognate sciences. No less than 445 current periodicals from all parts of the world are regularly received and the whole stock is increasing at the rate of 2,500 to 3,000 books every year. A sum of Rs. 4,500 is spent annually from the Research Funds of the Council on the purchase of new books and current periodicals.

The following figures give an idea of the progressive development of the Library during recent years :—

Year.	Accession.			Circulation.	
	Books.	Pamphlets, reprints and translations.	Periodicals.	Books.	Periodicals.
1930 . . .	1,500	1,000	100	552	No record.
1931 . . .	4,000	2,000	140	613	Do.
1932 . . .	6,451	3,500	160	724	Do.
1933 . . .	9,427	5,000	179	992	Do.
1934 . . .	11,259	6,000	226	1,234	2,842
1935 . . .	13,145	8,500	270	1,391	3,000
1936 . . .	14,708	10,000	286	1,871	3,054
1937 . . .	16,150	11,000	307	2,069	5,674
1938 . . .	18,730	12,000	380	2,342	9,546
1939 . . .	20,114	14,100	422	3,109	13,113
1940 . . .	21,560	16,500	445	2,705	14,708

(*iii*) 3,221 new books and publications were added to the Library during the year under report. The details of these additions are as follows :—

(1) By purchase 251
(2) Through exchange 2,653
(3) Bound volumes of Journals 317

As usual the United States Department of Agriculture and its various Experimental Stations and Great Britain were generous in the supply of the publications and the special thanks of the Council are due to them.

(*iv*) The number of current periodicals increased to 445 as compared to 422 last year. Of this number, 94 are purchased from the Research Funds of the Council, and the rest are received on exchange or gratis.

(*v*) Hitherto the Imperial Bureau of Plant Genetics, Cambridge, was the main source of the supply of the translations of foreign papers, but since 1940 the Council's Library is also working as Branch Translation Library for the loan of the translations made in the Imperial Bureaux of Pastures and Herbage Crops. About 300 translations have so far been received from the latter Bureau, bringing the total number of the entire collection to about 700 . A classified list of these translations is in preparation and will be printed shortly for distribution to research workers.

(*vi*) The circulation statistics for the year are given below :—

(*i*) Loan of books	2,705
(*ii*) Circulation of current periodicals	14,708
(*iii*) Loan of Translations	12
Total	17,425

They show an increase of more than 7 1/2 per cent in the circulation of periodicals and a slight decrease in the loan of books. The total number of the issues for the year is, however, the highest recorded so far. This number does not include the use of books in the Reading Room and the officers' Sectional Libraries. The following subject analysis of the loan of books may be of interest :—

(1) Social and Economic Sciences	367
(2) Pure Science	185
(3) Medicine and Veterinary Medicine	112
(4) Agriculture (General)	1,372
(5) Agronomy, Crops, etc..	359
(6) Animal Husbandry and Dairying	107
(7) Technology	57
(8) Miscellaneous	146
Total	2,705

(*vii*) Reference service and bibliographical aid to research workers form the most important duty of the Library. The work involves a good deal of search and study of scientific periodicals, and has become a regular feature of the Library activities. Numerous inquiries about information on specific questions and requests for references to literature on particular subjects were received and complied with. To improve this service all the material received in the Library, including leaflets, reprints and small pamphlets, is carefully catalogued and indexed. There is a printed catalogue of Reprints and Pamphlets for 1936 and a Supplementary list incorporating entries up to the end of 1940 has been issued during the year.

B. Publications

188. *Indian Farming.*—(*i*) The Council's bimonthly journal *Agriculture and Livestock in India* was replaced in January 1940 by *Indian Farming*, a popular monthly magazine. Both in form and content the new magazine was specially designed so as to appeal to the layman. A number of specialists in agriculture and animal husbandry were invited to contribute articles specially written for the magazine. The response was very good and from the first issue there has been a steady flow of original articles. Efforts were also made to obtain articles on subjects of topical interest, for example rural reconstruction in various provinces and states, sugarcane research and the problem of feeding the army. The index to the first volume indicates the variety of material published. Many contributors found it difficult at first to write in the style required, but with every new issue contributors are beginning to understand the special requirements of this publication and are adjusting themselves accordingly.

(*ii*) *Agriculture and Livestock in India* used to publish abstracts of articles in the Council's scientific journals. The abstracts are, as a rule, useful only to scientists, and as *Indian Farming* is intended for a wider public, they do not find place there. Short notes on research in progress are, however, included under the section 'What the Scientists are doing.' In this section reports of meetings of scientific research workers are also included. Another popular section of the magazine is 'What would you like to know ?' In this section the Council's Experts reply to questions asked by readers.

(*iii*) The section entitled 'What's doing in all-India' is contributed chiefly by correspondents in the provinces and states. The correspondents are paid an honorarium of Rs. 50 per annum. Their duties are to report once a quarter on all activities in the local agricultural, animal husbandry and rural development fields. In this section reports of central activities such as meetings of the Advisory Board of the Imperial Council of Agricultural Research, the Board of Agriculture and Animal Husbandry and the Indian Central Cotton Committee are also published.

(*iv*) *Agriculture and Livestock in India* used to publish bibliographies from time to time. In *Indian Farming* there is a section for reviews of new books. A circular was sent to the leading publishers in India, Great Britain and the United States of America and books are received regularly for review. There is also a miscellaneous section entitled 'From all Quarters' for information on miscellaneous subjects, announcements, etc.

(*v*) A 50-page illustrated supplement was published with the November issue of *Indian Farming* to commemorate the golden jubilee of the Imperial Veterinary Research Institute, Mukteswar.

(*vi*) *Indian Farming* is illustrated on a profuse scale, and the illustrations appear to be appreciated by readers. Requests for permission to reproduce articles and photographs and for the loan of blocks from newspapers and magazines are frequently received.

(*vii*) Two publicity campaigns were organised for *Indian Farming*. Short advertisements were inserted in the leading daily newspapers in January 1940. Twenty thousand prospectuses were distributed through booksellers, Directors of Agriculture and Veterinary Services in the provinces and states and the Imperial Council of Agricultural Research office. A poster was also produced for display at bookshops, railway stations and Government offices thr.ughout

the country. As part of the second campaign a fresh prospectus which includes the comments on the first issue of *Indian Farming* is now being distributed.

(*viii*) The first issue of *Indian Farming*, which contained messages from His Excellency the Viceroy and the Hon'ble Sir Jagdish Prasad, Member for Education, Health and Lands, received an exceedingly good reception in the press and was sold out within a fortnight of publication. The number of subscribers increased month by month and on 31st March 1941 stood at 958.

(*ix*) In January 1941 *Indian Farming* was registered for transmission at a concessional rate of postage. The magazine is now regularly distributed on the 15th of every month.

189. *Science Journals.*—(*i*) *The Indian Journal of Agricultural Science* continued to be published once in two months. The six issues published during the year contained altogether 71 original articles, of which 20 may be classed as botanical, 14 chemical, 13 entomological, 6 on plant diseases and the rest on other subjects. In addition there were six book reviews and one research note.

(*ii*) The number of original articles published in the Council's quarterly, *The Indian Journal of Veterinary Science and Animal Husbandry*, was 30, of which 16 related to animal diseases, 4 to animal nutrition, 4 to dairying and 6 to general animal husbandry. In addition, there were five book reviews and 38 abstracts of articles from foreign journals selected with a view to their interest to Indian field workers.

190. *Monographs.*—(*i*) Sir John Russell, in his 'Report on the work of the Council in applying science to crop production', recommended that the Council should arrange for the preparation of critical monographs on Indian research work the records of which are now scattered over a large number of departmental publications and papers in scientific journals. In pursuance of this recommendation the Council has undertaken the preparation of critical monographs on the following six subjects, at a total cost of Rs. 36,000 :—

(1) Composting of Farm and Town Wastes in India.

(2) Dry Farming in India.

(3) Rice Breeding and Genetics in India.

(4) The Anatomy of the Ox.

(5) Animal Nutrition in India.

(6) Rinderpest in India.

(*ii*) In addition to these, a scheme for the preparation of a monograph on Horticultural Research in India has been recommended by the Advisory Board and is awaiting the approval of the Governing Body.

(*iii*) The first of these monographs, namely that on 'The Composting of Farm and Town Wastes in India', the preparation of which was entrusted to Dr. C. N. Acharya, M.Sc., Ph.D., has already been written up and is now in the press.

(*iv*) The Council has also sanctioned a scheme for the preparation of a book on 'The Insect Pests of Indian Crops'. In 1906, the late Mr. Maxwell Lefroy, the then Imperial Entomologist, published a useful book on the subject but this has been long out of print. In view of the amount of useful experience and data gained on the subject in the last 34 years, the need has been felt for an up-to-date and authoritative book on the subject. The book now proposed is expected to satisfy this need. Its preparation has been

entrusted to Dr. T. V. Ramakrishna Iyer, Retired Entomologist, Madras, who was associated with Mr. Maxwell Lefroy at the time the original book was written.

191. (*i*) Monographs, Bulletins and other publications issued during the year are as follows :—

(*a*) Scientific Monograph No. 14. Further Studies on Cereal Rusts in India, by K. C. Mehta.

(*b*) Miscellaneous Bulletins :—

No. 34. Some Practical Results of Sugarcane Research in India.

No. 35. Progress of Veterinary Research in India during the past twenty-five years, by F. Ware.

No. 38. Manuring of Paddy, by R. L. Sethi.

No. 39. Studies on the Preservation of Fruit Juices : II. Experiments on the preparation and preservation of fruit juices, by Lal Singh and Girdhari Lal.

No. 40. Grape-growing in Baluchistan, by A. M. Mustafa and M. Asghar Ginai.

No. 46. A Brief Survey of some of the Important Breeds of Cattle in India : III. Prize-winners at the second and third all-India cattle shows.

(*c*) Catalogue of Indian Insects. No. 25. Thysanoptera, by T. V. Ramakrishna Ayyar and V. Marghabandhu.

(*ii*) The following publications were in the press at the end of the year :—

(*a*) Scientific Monograph No. 15. The Poisonous Plants of India, by Bt. Col. R. N. Chopra.

(*b*) Miscellaneous Bulletins :—

No. 29. Report on the Prospects of Cinchona Cultivation in India, by A. Wilson and T. J. Mirchandani (2nd Edition).

No. 36. Milk Records of Cattle in Approved Dairy Farms in India, Vol. II, Part I—Cows, by K. P. R. Kartha.

No. 37. Milk Records of Cattle in Approved Dairy Farms in India, Vol. II, Part II.—Buffaloes, by K. P. R. Kartha.

No. 41. Fertilizer Experiments on Sugarcane in India, 1932-39, by R. D. Rege.

No. 42. Fruit Pests of Baluchistan, by Nazeer Ahmad Janjua and C. K. Samuel.

No. 43. A List of some of the more common Plants of the Desert Areas of Sind, Baluchistan, Rajputana, Kathiawar and South-west Punjab, with local names as far as available, by Y. Ramchandra Rao.

No. 44. Report on the Investigation into the possibilities of Manufacturing Insulation and Pressed Boards, Wrapping Papers and Straw-boards from Bagasse, by M. P. Bhargava and A. N. Nayer.

No. 45. Investigations on the cold storage of potatoes, by D. V. Karmarkar and B. M. Joshi.

(*c*) Catalogue of Indian Insects No. 26. Serphoidea, by M. S. Mani.

(*iii*) A complete list of the publications of the Imperial Council of Agricultural Research is given in Appendix X.

192. *Circulation.*—The following table shows the circulation figures for the Council's publications during the year under report :—

Name of periodical.	Supplied as exchanges. *	Sales.		Distributed free.
		Regular subscribers.	Average casual sales per issue.	
Indian Farming	225	870	75	222
Indian Journal of Agricultural Science	201	142	5	106
Indian Journal of Veterinary Science and Animal Husbandry.	169	141	4	100
Scientific Monographs . . .	135	12	22	62
Miscellaneous Bulletins . . .	132	7	347	71

* Including those supplied as exchanges by the Director, Imperial Agricultural Research Institute, New Delhi and Imperial Veterinary Research Institute, Mukteswar.

About 509 institutions in India and 281 abroad received one or more of the Council's publications either free or on exchange basis.

193. *Editorial Committee and Referees.*—(*i*) The following changes were made in the personnel of the Editorial Committee during the year :—

(1) Dr. J. N. Mukherjee, D.Sc., Ghosh Professor of Chemistry, Calcutta University, took the place of Dr. J. C. Ghosh, with effect from 1st May 1940.

(2) The following three members were added to the Committee :—

Director of Dairy Research, New Delhi.

Dr. Birbal Sahni, M.A., Sc.D. (Cantab.), D.Sc. (Lond.); F.R.S., Professor of Botany, Lucknow University.

Dr. S. Krishna, D.Sc., F.I.C., Biochemist, Forest Research Institute, Dehra Dun.

(*ii*) The Editorial Committee continued to receive the assistance of a large number of specialist referees in the examination of papers received for publication. The number of such referees during the year was 90 and the Council takes the opportunity of acknowledging the valuable help received from them.

CHAPTER VI—SUGARCANE

A. General

194. *Schemes sanctioned.*—During the year under report the Sugar Committee met twice—in June and November 1940. The recommendations made at these meetings are given in Appendix IX. The Committee recommended new schemes and extensions of existing schemes as follows, at a cost and for the period indicated :—

(*a*) New Schemes	Cost	Period
	Rs.	
(1) Central Stations for Sugarcane Research—		
(i) Shahjahanpur, U. P.	65,000 per annum.	Up to 31st Mar. 1944.
(ii) Pusa, Bihar	35,000 per annum	Do.
(2) Sugarcane Research Station, Sind	14,800	3 years.
(3) Appointment of a Physiologist at Coimbatore. .	15,880	3 years.
(4) Biology of sugarcane pests, Aligarh Muslim University	3,900	2 years.
(5) Grading of *gur* and *boora* (Agricultural Marketing Adviser to the Govt. of India)	2,600	1 year.
(6) Ascertaining the factors forming the basis for grading *gur* and *rab* (Imperial Institute of Sugar Technology)	10,000	3 years.
(7) Publicity of the results of research at the Sugar Station, Bilari	5,500	1 year and 1 month.
(8) Training in indigenous methods of *gur* and sugar manufacture (Bilari)	*Nil.*	
(9) Investigation on the feeding value of molasses (Imperial Veterinary Research Institute) . .	10,000	6 months.
(10) The treatment of sugar factory effluents and conversion of molasses into manure (Imperial Institute of Sugar Technology)	4,000	2 years.
(*b*) *Extensions.*		
(11) The regional section of the scheme on insect pests of sugarcane	6,000 per annum for each station.	Up to 30th Sept. 1941.
(12) Sugar Research and Testing Station, Bilari . .	76,000	2 years and 7 months.

All the above schemes have received the approval of the Governing Body except No. 3 which will be referred to the Governing Body in July 1941.

195. *Indian Central Sugar Committee.*—The views of provincial Governments, Indian states and sugar associations were obtained regarding the constitution of an Indian Central Sugar Committee. The Madras Government and the Bhopal State do not consider the present to be an opportune time for proceeding with this scheme, especially as the Standing Sugar Committee of the Imperial Council of Agricultural Research is carrying out satisfactorily almost all the functions of the proposed Central Committee. All the other Governments favour the constitution of a statutory body on the lines of the

Indian Central Cotton Committee or the Indian Central Jute Committee. The proposal is now being further examined.

196. *Funds for Research.*—As in 1940-41 the Government of India made a further grant of Rs. 3 lakhs for sugarcane research work during 1941-42. The expenditure on sugarcane schemes has been shown in the accounts of the Council for 1940-41 (Appendix VII).

B. Agriculture

197. *Central Sugarcane Stations.*—(*i*) At its meeting held in May 1939 the Sugar Committee urged that the present research work required to be re-orientated to conform to the practical requirements of the cultivator. It was recommended that some selected stations should be developed into 1st class research stations where all types of work would be done on sound lines and that other stations should concentrate on varietal work and only take up other work if competent staff and other facilities were available. This recommendation was endorsed by the Advisory Board, and was approved in principle by the Governing Body in July 1939.

(*ii*) As the United Provinces and Bihar Agricultural Departments were also considering the question of the re-organisation of research work on sugarcane in their respective provinces it was considered desirable to evolve a joint scheme so as to secure greater co-ordination. An informal meeting with the representatives of those Governments was accordingly held at Simla on the 13th June 1940, and general lines of research agreed to.

(*iii*) The question was then referred to the Sugar Committee which met in June 1940. It considered that :—

(*a*) one central station for the whole of India was not feasible;

(*b*) within certain areas of different environment central sugarcane research stations were necessary. The Committee recommended a central station for the United Provinces and another for Bihar and held, with regard to other parts of India, that the establishment of central stations would depend entirely on the work that had already been done and on their own immediate problems ;

(*c*) the United Provinces and Bihar schemes in their final form should be considered and co-ordinated by a sub-committee, and that it should submit the findings direct to the Governing Body. This was endorsed by the Advisory Board.

(*iv*) The Sub-Committee met in August 1940 and made recommendations about the work to be taken up at one central station in the United Provinces and one in Bihar and the staff to be employed for the same.

(*v*) The Governing Body in December 1940 sanctioned the continuance of the research work at Shahjahanpur till 31st March 1944 at a cost of about Rs. 11,000 and also sanctioned an additional sum not exceeding Rs. 65,000 a year till 31st March 1944 for the United Provinces Central station subject

to the following conditions suggested by the Economic Committee and endorsed by the Standing Finance Committee :—

The provincial Government

(*a*) would meet all the non-recurring expenditure and the difference between the recurring expenditure and Rs. 76,000 (the Council's grant every year),

(*b*) would not reduce the expenditure it incurred at present on sugarcane research,

(*c*) maintain a whole-time officer in charge of the station,

(*d*) would put into operation this scheme not later than 1941, and

(*e*) in the event of the cost of working falling below that estimated, the savings accruing would be shared equally between the Council and the provincial Government.

(*vi*) It also sanctioned the continuance of the research work at Pusa till 31st March 1944 at a cost to the Council not exceeding Rs. 30,000 per annum and also sanctioned an additional sum not exceeding Rs. 35,000 a year till 31st March 1944 for a Bihar central station subject to the following conditions suggested by the Economic Committee and endorsed by the Standing Finance Committee :—

(*a*) The provincial Government should meet all the non-recurring expenditure involved.

(*b*) They should bear the whole cost of continuing the Patna Sub-station from its own funds.

(*c*) They should agree not to reduce the expenditure incurred at present on sugarcane research.

(*d*) The total grant sanctioned by the Council for 1942-43 onwards on the research station would not exceed Rs. 65,000.

(*e*) Any excess expenditure that might have to be incurred over and above that figure should be borne by the provincial Government.

(*f*) The scheme should be put into operation not later than 1941.

198. *Work on Insect Pests.*—The question of continuance of the regional section of the Scheme on Insect Pests of Sugarcane came up before the Sugar Committee in November 1940. It recommended the continuance of the regional centres up to the 30th September 1941 pending examination of the working of the scheme by a special sub-committee. This special sub-committee met in March 1941. On its recommendations some alterations and additions have been made in the programme of work with immediate effect. The question of the continuance of the scheme beyond 30th September 1941 and its future programme of work will be considered again by the special sub-committee after a detailed report of the work so far done on the scheme has been received from Professor P. C. Mahalanobis of the Calcutta University and Mr. P. V. Isaac, Second Entomologist, Imperial Agricultural Research Institute.

199. *Review of sugarcane research.*—A review of the results obtained from the working of the sugarcane research schemes financed by the Council is given in the publication entitled " Some Practical Results of Sugarcane Research in India ". A summary of this bulletin is being published in Urdu and Hindi for the benefit of sugarcane cultivators.

C. Sugar Technology

200. *Industrial and technical.*—(*i*) As a result, in part, of the help given to sugar factories by the Imperial Institute of Sugar Technology, their technical processes have improved as may be seen from the following figures of the percentage recoveries of sugar from cane during the seasons 1939-40 and 1938-39 :—

Particulars.	Percentage Recovery of Sugar from Cane.							
	1939-40				1938-39			
	U. P.	Bihar	All other provinces	All India	U. P.	Bihar	All other provinces	All India
Maximum for any factory	10·34	10·31	12·31	12·31	10·09	9·96	12·25	12·25
Minimum for any factory	5·93	8·34	4·49	4·49	7·41	8·20	6·00	6·00
For the whole group .	9·37	9·29	9·88	9·45	9·14	9·00	9·91	9·29

(*ii*) The highest recovery for any factory for the season was 12·31 per cent as against 12·25 per cent during the preceding season. The average extraction for the whole country shows an increase of 0·16 per cent over that of the previous season. The recoveries in the U. P. and Bihar have increased by 0·23 per cent and 0·29 per cent respectively.

(*iii*) Information under the Sugar Production Rules, 1935, was obtained as usual from the factories in prescribed forms and was duly compiled and published for the benefit of the industry. A new form, *viz.* form J, in which the dates of starting and closing would be reported to the Institute by factories was added to the forms appended to these rules. On the basis of results submitted in the final manufacturing reports in form E (*i*) for the season 1939-40, notes pointing out defects in the working of factories and suggesting possible improvements were sent to all the central sugar factories. In order to enable the factories to be in touch with the research work carried out at the Institute and elsewhere, the practice of issuing " Sugar Notes " was continued.

(*iv*) Collaboration between the Institute and the sugar factories was further extended during the season 1940-41 ; research experiments on a number of problems were carried out by the Institute in collaboration with sugar factories. The Institute is thankful to the factories for their co-operation and the facilities which they offered to the Institute in carrying out large-scale work.

(*v*) There was heavy demand from factories for technical assistance from the Institute. The nature and amount of this assistance may be appraised by reference to the following figures.

(*a*) Number of specifications and schemes drawn up and examined by the Institute	11
(*b*) Number of run and final manufacturing reports scrutinized . .	65
(*c*) Number of visits paid by the Director and officers of the Institute to factories for providing technical advice	54
(*d*) Number of sugar factories that were assisted in the recruitment of their technical staff	51

201. *Research and experiments.*—(*i*) The investigational and research work so far pursued by the Engineering Section has largely related to problems encountered in the course of visits to sugar factories for giving technical advice and much of this work has been conducted concurrently in the Experimental Sugar Factory and the industrial factories. For this purpose, various alterations and additions were made to the machinery of the Experimental Sugar Factory in the course of the past two years which have served appreciably to improve the economy of operation, and have resulted in a reduction of fuel consumption. The investigations started in 1939-40 in connection with the boiler and milling plants were extensive in scope, and opened up many new avenues for research. The subjects investigated were as under :—

(*a*) Bagasse furnace operation and design.

(*b*) CO_2 content of flue gases for maximum efficiency.

(*c*) Determination of steam wetness.

(*d*) Milling plant investigations.

(*e*) Horse power requirements of mills.

(*f*) Entrainment in evaporation.

(*ii*) In connection with sugar technology, the following problems were investigated :—

(*a*) Effect of the presence of foreign matters in syrup on the exhaustibility of mother liquors in final massecuites.

(*b*) Manufacture of factory gur.

(*c*) Manufacture of refined sugar for B. S. S. (in collaboration with Physical Chemist).

(*d*) Manufacture of golden syrup.

(*e*) Sweetening of filter press cake.

(*f*) Application of the method of fractional liming in the sulphitation plants.

(*g*) Mud volume trouble with Co. 313 in Bihar.

(*h*) Efficiency of sulphur furnaces.

(*iii*) In the sugar chemistry section, work was taken up on the following items :—

(*a*) The cause of heavy scales.

(*b*) Clarification of final molasses and recovery of alum.

(*c*) The exhaustibility of Indian factory molasses.

(*d*) The manufacture of Ultramarine Blue.

(*e*) The system, sucrose-water.

(*f*) The solubility of calcium sulphite in sugar solutions at different *p*H values.

(*g*) The use of " Deola " mucilage in the clarification of First and Second heavy molasses.

(*h*) Examination of the quality of lime used in sugar factories.

(*i*) Statistical method of determining the cause of salinity and bitterness in *gur* (in collaboration with the Statistical Section).

(*j*) Efficiency of sulphur furnaces in sugar factories (in collaboration with the Sugar Technology Section).

(*k*) Utilisation of molasses—

(*i*) Recovery of sucrose, (*ii*) Preparation of table syrup.

(*l*) Solubility of Sugars at *p*Hs 4-11.

(*m*) Preparation of compost from the waste products of the sugar industry.

(*n*) Comparative advantages and disadvantages of different methods of washing filter press cakes (in collaboration with the P. S. T.)

(*o*) Cane wax from filter press cake.

(*iv*) Investigations on the physical chemistry side were carried out on :—

(*a*) Removal of suspended matter from syrups and molasses for re-boiling.

(*b*) Utilisation of filter press mud—

(*i*) Activated carbons.

(*ii*) Recovery of sulphur and manufacture of sulphur compounds.

(*iii*) Preparation of a dye stuff.

(*iv*) Filter-aids from press mud.

(*c*) Manufacture of sugar candy.

(*d*) Recovery of sulphur dioxide from waste gases.

(*e*) Keeping quality of sugars.

(*v*) In connection with biochemistry the following problems were investigated :—

(*a*) Large-scale distillations of acetone and butyl alcohol.

(*b*) Experiments on the concentration of acetic acid by the azetropic process, using ethyl acetate as entraining liquid.

(*c*) Manufacture of yeast for edible and cattle fodder purposes.

(*d*) Manufacture of golden syrup by enzyme treatment.

(*e*) Manufacture of glucose syrup and solid glucose from starch.

(*f*) Construction of Molasses Test Patch on Clyde Road.

(*vi*) The statistical section enquired into :—

(*a*) The distribution of grain size in the different Indian Sugar Standards grades of sugar.

(*b*) The demand of sugar in India in relation to its price.

(*c*) Study of factors responsible for bitterness in *gur*.

202. *Sugar Research and Testing Station.*—(*i*) Tests were carried out on bullock crushers, power-driven cane mills, *bels*, furnaces and a sugar dryer.

(*ii*) Research work on hand at the station related to—

(*a*) Use of carbon on a large scale for making white gur or *rab*.

(*b*) Seeding of *rab* in revolving crystallizer with varying proportion of aerated and un-aerated *rabs*.

(*c*) Experiments on the yield and losses in the manufacture of sugar by *Kanchi* system.

(*d*) Experiments on the effect of manure and cane quality on the keeping quality of *gur*.

(*e*) Testing of barks other than those already used for clarification of cane juice.

(*f*) The use of sulphur dioxide in open pan system of sugar manufacture.

(*g*) Testing of furnaces for manufacture of activated carbon.

(*h*) Further work on the manufacture of activated carbon from paddy husk and re-activation of used carbons.

(*iii*) The training of persons engaged in the manufacture of sugar and *gur* by the indegenous methods was continued.

(*iv*) A scheme for publicity and demonstration designed to acquaint the public with the results of the researches carried out at the station came into operation in February 1941.

203. *Bureau of Sugar Standards.*—(*i*) The Indian Sugar Standards for 1940-41 were prepared according to the recommendations of the Advisory Committee of the Bureau and issued to the industry. During the year the Bureau sold 21 new sets of different types and renewed 73 sets that had been sold in previous years. It also sold 30 filled and 19 empty standard bottles. The sale of empty bottles was restricted due to difficulty in procuring fresh consignments from abroad on account of war.

(*ii*) The review of the quality of sugar produced in India by Central Sugar Factories during the season 1939-40 was compiled and published and reprints sent to sugar factories and representative sugar associations. Pamphlets in Hindi and Urdu giving complete information regarding the standards, their uses and avantages, have been prepared and are now in the press. Copies of these will be distributed among merchants and brokers when ready.

(*iii*) Factories were advised to stamp sugar bags with the Indian Sugar Standard numbers denoting the quality of sugar contained in them. This matter has also been referred to the Chairman, Sugar Commission, United Provinces and Bihar.

(*iv*) The sanction of the Government for the scheme of research into factors forming the basis of grading of *gur* and *rab* having been received, arrangements were made for obtaining the required number of samples of *gur* and *rab*.

204. *Cattle-feed experiments.*—(*i*) Investigations were carried out to devise means for storing Bago-molasses in godowns without deterioration. Attempts were also made to find out the causes of spontaneous combustion of the feed.

(*ii*) Laboratory experiments were made to find out the conditions under which deterioration takes place in the feed during storage. Samples of the feed were kept in atmospheres of different relative humidities varying from 35 per cent to 100 per cent and observations were made periodically to note the absorption of moisture. It was found that the absorption of moisture varies directly with the relative humidities.

(*iii*) Studies were made of the spontaneous combustion of the feed. Although the exact factors responsible for spontaneous combustion have not been fully ascertained, the presence of thermophylic organisms in the feed indicated that the localisation of heat due to the large amount of organisms

present at particular places may be a cause. Experiments were made in the laboratory to observe the rise in temperature in heaps formed of the feed. The maximum temperature obtained was 70°C but no combustion took place in the feed. The best way to prevent such an occurrence appears to be to store the feed in stacks with air spaces in between the stacks so as to permit the free circulation of air in order that the heat generated in the stack may not be localised at one place but may be easily dissipated.

(*iv*) Trials on a large scale are now being made at the Imperial Veterinary Research Institute, Izatnagar. The results of the feeding trials conducted there so far indicate that bago-molasses has at least twice the feeding value of *bhusa*.

(*v*) As quotations for machinery for the preparation of the feed were not forthcoming from firms of machinery makers abroad, it was decided to construct or improvise the machinery from the plant and equipment ordinarily available in sugar factories. A strainer arrangement for collecting fine bagasse has been provided in the bagasse elevator of the Experimental Sugar Factory. This arrangement requires practically no operatives for its working and seems very adaptable for large-scale work. The fire heated mixer with stirrer designed for Road Composition experiments was used for heating molasses and rinsing bagasse screenings. The mixing was very thorough and about 8—10 mds. of feed could be prepared at one time. There was, however, some difficulty in taking out the feed from the mixer, which has now been overcome.

(*vi*) The scheme has now terminated. The experimental part of the scheme has been fully worked out. The technical details of the method of manufacture of the feed, information regarding its economic aspects, feeding value and method of feeding to the cattle, method of storing in the godowns without deterioration have all been collected and are available for general information.

205. *Manufacture of sugar candy.*—(*i*) The scheme for research into the manufacture of sugar candy was sanctioned in April 1940. Its object is to initiate research work for surveying the existing methods and for introducing new and improved processes and equipment.

(*ii*) Preliminary experiments in connection with the manufacture of sugar candy under the scheme were started at the Ajudhia and Ravalgaon sugar factories on the 25th January and 14th February 1941 respectively. The experiments are still in the preliminary stage.

206. *Statistical.*—(*i*) The work primarily consists of—

(*a*) General statistical work,

(*b*) The management of the Sugar Trade Information Services,

(*c*) Statistical research, and

(*d*) Teaching.

(*ii*) The Sugar Production Rules, 1935, require all sugar factories in British India to submit to the Director, Imperial Institute of Sugar Technology, Cawnpore, returns in prescribed forms, on the production of sugar. These returns are of two kinds, technical and non-technical.

All non-technical returns are received in the Statistical Section where they are checked and their main contents entered in ledgers kept for the purpose; various consolidated statements, reviews and notes, prepared on the basis of these statements, are published from time to time in the *Indian Trade Journal*.

(*iii*) The Institute acts as a repository of statistical information on all subjects pertaining to the production and marketing of sugar in India ; enquiries are received from Government departments, public bodies, sugar factories and private individuals and are properly attended to. A very large number of investigations of a statistical nature connected with the programme of sugar control in the U. P. and Bihar have been carried out in the Institute. The provincial Governments have now sanctioned a staff of two Statistical Assistants who will work in the Institute under the direction of the Statistician, mainly on subjects referred to the Institute for investigations by the Governments. In order that the Institute may not lack the basic data for these investigations, the Governments have made rules requiring factories in the two provinces to submit to the Director, returns on forms prescribed for the purpose.

(*iv*) The Institute continued to run two sugar trade information services, namely, the Sugar Postal Service and the Indian Sugar Trade Information Service. Subscribers of the latter are supplied with information on sugar market conditions in India while those of the former receive information about sugar markets in both India and abroad. The reorganisation of these services is under consideration.

207. *Training in sugar technology.*—(*i*) In the year 1940-41, thirty-five students as per details given below completed their courses—

(*a*) Associateship in Sugar Engineering	2
(*b*) Associateship in Sugar Technology	10
(*c*) Sugar Boiler's Certificate Course	2
(*d*) Chemical Control (Short Course)	4
(*e*) Bacteriology (Short Course)	1
(*f*) Pan Boiling (Short Course)	11
(*g*) Fuel Economy and Boiler Control (Short Course)	2
(*h*) Statistics for Sugar Students (Short Course)	1
(*i*) Statistics for Research Students (Short Course)	2

(*ii*) The number of students admitted to the different courses was as follows :—

(*a*) Fellowship Course in Sugar Technology	4
(*b*) Associateship Course in Sugar Engineering	1
(*c*) Associateship Course in Sugar Technology	6
(*d*) Sugar Boiler's Certificate Course	8
(*e*) Chemical Control (Short Course)	9
(*f*) Pan boiling (Short Course)	11
(*g*) Fuel Economy and Boiler Control (Short Course)	2
(*h*) Statistics for Sugar Students (Short Course)	1
(*i*) Statistics for Research Students (Short Course)	2
Total	44

(*iii*) Out of the forty-four students admitted in 1940-41, twenty came from the U.P., nine from the Punjab, five from Indian States, three each from Bombay and Bengal, two from Madras and one each from Bihar and the N.-W. F. P.

208. *Publications and Library.*—Notes and consolidated statements giving detailed statistical information published in the *Indian Trade Journal* were 72 in number. Books and publications added to the Library during the year under report numbered 136. Three new journals were subscribed to while six journals which were not considered indispensable for research work were discontinued.

D. Sugar Marketing

209. *Survey.*—(*i*) The marketing survey of sugar was taken in hand in December 1937. The intention is to cover the various raw and refined sugars prepared from cane and palm juice in India together with the different sugar products imported from abroad.

(*ii*) A large mass of valuable information on the different aspects of the industry was collected by the central, provincial and state marketing officers and through the various Government departments and trade concerns connected with the subject. Special attention was paid to problems such as the utilisation of the cane crop for different purposes including the preparation of *gur* and *khand* and the quantitative and qualitative demand for various sugar products in respect of which reliable information has hitherto been unavailable. Problems connected with overproduction and price fixation as well as seasonal fluctuations in prices and price differences due to variations in quality were considered in detail. Trade practices and costs of distribution on which the return of the cultivator largely depends were also examined. The question of standardisation of grades and quality control and the possibilities of increased consumption and expansion of markets for the various sugar products, received attention.

(*iii*) During the year under report, the staff was mainly busy with the compilation of the data received from the various provinces and states and the drafting of the all India report which is under print.

(*iv*) The information collected was also found useful in attending to queries from the various Government departments and trade concerns. Arrangements were made through the local marketing officers for the collection of the necessary data for the Gur Marketing Information Service organised by the Gur Development Department, United Provinces.

210. *Grading.*—(*i*) The experimental grading of *gur* which was started towards the end of 1939-40 proved to be popular and the number of packing stations increased from 2 to 33 during the year. Certain preliminary steps were taken to include *gur* in the schedule to the Agricultural Produce (Grading and Marking) Act 1937.

(*ii*) Interest was also evinced in the grading of *bura*. A considerable quantity of this product which is put on the market is prepared from sugar/*khand* and *gur* mixed instead of from pure sugar or *khand*. With the help of a small grant from the Council, arrangements were made for analysing a number of samples with a view to preparing suitable grade specifications for this product.

CHAPTER VII.—AGRICULTURAL MARKETING

211. *General.*—(*i*) The five years' sanction for the Central Marketing Organisation expired in December 1939. The Government of India extended the sanction by one year from the date of expiry in the first instance and in December 1940 they sanctioned as an *ad interim* measure and pending further examination, the continuance of the Central Marketing staff up to the end of August 1941. The Government of India have also decided on a policy of progressively reducing the grants to provinces from year to year in order that the entire responsibility for running the provincial agricultural marketing schemes may be assumed by the Governments concerned in future. The responsibility for developing agricultural marketing lies within the provincial field and the ultimate responsibility in this respect will have to be assumed by the provinces. In order to avoid dislocation the Central Government has agreed to a *progressive* reduction in the grants. The Government of India placed at the disposal of the Council a sum of Rs. 1,80,000 only for distribution to the provinces during 1940-41, as against the sum of Rs. 2,00,000 per annum granted in previous years.

(*ii*) Several Indian States continued to co-operate with the Central Government in running the agricultural marketing schemes. In addition to carrying out the surveys in accordance with the all-India programme, they also undertook grading and development work. In this connection several of them enacted, or were considering proposals to enact, grading and marking legislation on the lines of the British Indian Act.

(*iii*) In order to relieve the Agricultural Marketing Adviser of a considerable amount of administrative work and to enable him to devote more time and attention to the technical portion of the work, a new post of Deputy Agricultural Marketing Adviser was created and Dr. N. Das, I.C.S., was appointed to the post. Certain additions to the ministerial as well as technical staff were also made during the year.

(*iv*) " The Annual Report of the Agricultural Marketing Adviser and the summarised reports of Senior Marketing Officers in provinces and certain states for the year ending the 31st December 1940 ", which has been published separately, contains a full account of the progress achieved in the two-fold programme (1) surveying existing marketing conditions and preparing all-India survey reports thereon and (2) applying the results of such surveys to the practical sphere of marketing of agricultural products.

212. *Surveys.*—The reports on the marketing of coffee, grapes and potatoes were issued during the year. An abridged edition of the report on eggs was published in English and also a Marathi version of the report on linseed. Complete proofs of the reports on milk, rice and groundnuts were also ready before the close of the year. Portions of the reports on hides and sugar were in the press. Besides these, a " Preliminary Guide to Indian Fish, Fisheries and Methods of Fishing " was also prepared and had reached the proof stage.

213. *Grading and standardisation.*—(*i*) The grading of ghee, eggs and other commodities continued steadily and there was a marked expansion in the grading of rice, *ata*, different kinds of fruits and potatoes. Grading was also successfully extended to cotton of improved varieties, citrus fruit products, edible-oils and *gur* (jaggery). The *gur* grading scheme was financed partly from a small grant made by the Council for the purpose. The grant was also intended to cover the expenditure on the collection and analysis of samples of *bura* with a view to drawing up grade specifications therefor.

(*ii*) A noteworthy feature of the year was that an increasingly large number of merchants and producers co-operated in the grading schemes. Before the close of the year over 90 lakhs rupees worth of produce was graded under the AGMARK at more than 450 centres by 380 authorised packers. Thirteen experimental grading stations were run from Central funds during the year.

(*iii*) The butter grading scheme was initiated towards the close of the year and proposals for the grading of sann hemp, wheat of selected varieties and seed lac were under consideration.

214. *Quality control.*—Simultaneously with the expansion of grading activities, steps were also taken to ensure that the graded produce conformed to the prescribed quality characteristics. While the quality control work in respect of ghee and oils was carried on in the Central Ghee Control Laboratory, Cawnpore, the analysis of samples of graded fruit products and *ata* was done at the Imperial Agricultural Research Institute, New Delhi and the Cereal Research Laboratory, Lyallpur, respectively. The number of authorised inspectors of graded produce was gradually increased and systematic arrangements were made for the collection and examination of check samples of graded produce. The working of the schemes was generally satisfactory and only in one case the certificate of authorisation of a ghee packer had to be cancelled on the ground of negligence. Three cases of attempts at imitating the AGMARK were discovered and suitably dealt with.

215. *Publicity.*—In order to give publicity to the AGMARK grading schemes, suitable posters for graded *ata*, ghee and eggs were designed and displayed at all important centres. Members of the marketing staffs also participated in various agricultural exhibitions and cattle shows.

216. *Miscellaneous.*—Legislation relating to the regulation of markets and standardisation of weights and measures was passed in certain provinces and was under consideration in several others. Other miscellaneous items of work such as market news service and trials with improved containers for graded produce were continued as usual. With a view to exploring the possibilities of export markets consignments of hand picked selected groundnut kernels and eggs were sent to the United Kingdom. The favourable reception given to the consignment of groundnuts showed that India could compete with China on equal terms in this trade provided the AGMARK standard of quality was maintained. A report on the consignment of eggs is awaited.

217. *Cold storage.*—The Council continued its cold storage scheme during the year. The Assistant Marketing Officer, Cold Storage, conducted several standing and running trials with the dry ice, wet ice and eutectic vans in collaboration with the North Western Railway authorities and his reports thereon were discussed at a meeting of an *ad hoc* Cold Storage Committee held in March 1941. The meeting decided to give effect to some of the recommendations in the reports and to repeat the trials after modifying the vans suitably.

APPENDIX I.

IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

Governing Body.

1. The Honourable Sir Girja Shankar Bajpai, K.B.E., C.I.E., I.C.S., *Chairman.*
2. Mr. P. M. Kharegat, C.I.E., I.C.S., *Vice-Chairman.*
3. The Hon'ble Sir A. Ramaswami Mudaliar.
4. Joint Secretary to the Government of India, Education, Health and Lands Department.
5. Mr. A. C. Turner, C.I.E., I.C.S., Secretary, Finance Department, Government of India.
6. Mr. H. M. Hood, C.S.I., C.I.E., I.C.S., Second Adviser to H. E. the Governor of Madras, in charge of Agriculture.
7. Mr. H. F. Knight, C.S.I., C.I.E., I.C.S., Adviser to H. E. the Governor of Bombay, in charge of Agriculture.
8. The Hon'ble Minister for Agriculture, Bengal.
9. Mr. P. W. Marsh, C.S.I., C.I.E., I.C.S., Adviser to H. E. the Governor of the United Provinces, in charge of Agriculture.
10. The Hon'ble Minister for Development, Punjab.
11. Mr. E. R. J. R. Cousins, C.I.E., I.C.S., Adviser to H. E. the Governor of Bihar, in charge of Agriculture.
12. Sir Geoffry Burton, K.C.I.E., I.C.S., Financial Adviser to H. E. the Governor of the Central Provinces and Berar.
13. The Hon'ble Minister for Agriculture, Assam.
14. Lieutenant-Colonel W. F. Campbell, C.I.E., I.A., Adviser to H. E. the Governor of the North-West Frontier Province.
15. Mr. E. C. Ansorage, C.I.E., I.C.S., Adviser to H. E. the Governor of Orissa.
16. The Hon'ble Minister for Agriculture, Sind.
17. The Hon'ble Mr. Hosain Imam, Member, Council of State, Representative of the Council of State.
18. Pandit Sri Krishna Dutt Paliwal, M.L.A. } Representatives of the Legislative
19. Mohd. Azhar Ali, Esquire, M.L.A. } Assembly (Central).
20. Mr. R. Scherer, Representative of the Associated Chambers of Commerce of India.
21. Mr. Debi Prasad Khaitan, Representative of the Federation of Indian Chamber of Commerce and Industry.
22. Dr. B. K. Badami, Director of Veterinary Department, Government of Hyderabad. } Representatives of the Advisory Board of the I. C. of A. R.
23. Mr. D. R. Sethi, I.A.S., Director of Agriculture, Bihar
24. The Revenue Member to the Government of Hyderabad.
25. The Member in-charge of Agriculture, Government of Mysore.
26. The Member in-charge of Agriculture, Government of Baroda.
27. The Diwan of Cochin.
28. The Diwan of Travancore.
29. The Revenue Member, Government of Bhopal.
30. The Development and Commerce Minister, Government of Jammu and Kashmir.
31. The Home Minister, Gwalior.
32. Diwan Bahadur Sir T. Vijayaraghavacharya, K.B.E.

The Secretary, Imperial Council of Agricultural Research, *Secretary.*

Advisory Board.

1. Vice-Chariman, Imperial Council of Agricultural Research, *Chairman*.
2. Agricultural Commissioner with the Government of India.
3. Animal Husbandry Commissioner with the Government of India.
4. Agricultural Marketing Adviser to the Government of India.
5. Director, Imperial Agricultural Research Institute, New Delhi.
6. Director, Imperial Veterinary Research Institute, Mukteswar.
7. Director, Indian Institute of Science, Bangalore.
8. Director of Agriculture, Madras.
9. Director of Agriculture, Bombay.
10. Director of Agriculture, Bengal.
11. Director of Agriculture, United Provinces.
12. Director of Agriculture, Punjab.
13. Director of Agriculture, Bihar.
14. Director of Agriculture, Central Provinces and Berar.
15. Director of Agriculture, Assam.
16. Agricultural Officer, North-West Frontier Province.
17. Director of Development, Orissa.
18. Director of Agriculture, Sind.
19. Mr. T. J. Hurley, M.R.C.V.S., Director of Veterinary Services, Madras.
20. Mr. E. S. Farbrother, M.R.C.V.S., I.V.S., Director of Veterinary Services, Bombay.
21. Mr. A. D. MacGregor, F.R.C.V.S , Principal, Bengal Veterinary College and Veterinary Adviser to the Government of Bengal.
22. Mr. T. J. Egan, M.R.C.V.S., I.V.S., Director, Civil Veterinary Department, United Provinces.
23. Captain U. W. F. Walker, M.C., M.R.C.V.S., I.V.S., Director of Veterinary Services Punjab.
24. Mr. M. I. Malik, Director of Veterinary Services, Bihar.
25. Mr. H. B. Shahi, M.Sc., M.R.C.V.S., D.T.V.M., Director of Veterinary Services, Central Provinces and Berar.
26. Rai Sahib S. C. Ghosh, G.B.V.S., Director of Veterinary Department, Assam.
27. Mr. S. M. Sarwar, Superintendent, Civil Veterinary Department, North-West Frontier Province.
28. Mr. J. H. G. Jerrom, M.R.C.V.S., I.V.S., Director of Veterinary Services, Sind.
29. Mr. A. M. Mustafa, Agricultural Officer in Baluchistan. (Representative of minor administrations).
30. Mr. H. S. Howard, I.F.S., Inspector General of Forests. (Representative of the Forest Research Institute).
31. Diwan Bahadur T. Raghaviah, C.S.I. (Representative of the Co-operative Movement).
32. Lt-Col. E. Cotter, I.M.S., Public Health Commissioner with the Government of India. (Representing the Indian Research Fund Association).
33. Dr. Birbal Sahni, Sc.D. (Cantab.), Lucknow University
34. Prof. C. N. Vakil, M.A., M.Sc., F.S.S., University Professsor of Economics, Bombay University.
35. Khan Bahadur Mian M. Afzal Hussain, I.A.S., Vice-Chancellor, Punjab University.
36. Mr. N. S. Subba Rao, Vice-Chancellor, Mysore University.

(33–36) Representatives of the Inter-University Board.

37. Mr. P. H. Carpenter. (Representative of the Indian Tea Association and the United Planters Association of Southern India).
38. Mr. H. Sitarama Reddy. (Representative of the Indian Central Cotton Committee).
39. Director of Agriculture, Hyderabad.

40. Director of Agriculture, Mysore.
41. Commissioner of Agriculture, Baroda.
42. Director of Agriculture, Cochin.
43. Director of Agriculture and Fisheries, Travancore.
44. Director of Agriculture and State Chemist, Bhopal.
45. Director of Agriculture, Gwalior.
46. Director of Agriculture, Kashmir.
47. Director of Veterinary Department, Hyderabad.
48. Superintendent, Civil Veterinary Department, Mysore.
49. Deputy Director of Veterinary and Animal Husbandry Science, Baroda.
50. Personal Veterinary Assistant to the Director of Agriculture, Cochin.
51. Revenue Secretary, Bhopal.
52. Superintendent, Civil Veterinary Department, Kashmir.
53. Director of Veterinary Department, Gwalior.
54. Brigadier, J. J. M. Souter, O.B.E., Director of Veterinary Services in India, General Headquarters.
55. Mr. G. T. Tait, Central Publicity Officer, Indian State Railways.
56. Dr. Nazir Ahmad, M.Sc., Ph.D. (Cantab.), Director, Technological Laboratory, Indian Central Cotton Committee.
57. Sardar Bahadur Sir Datar Singh.
58. The Hon'ble Maulvi Sir Mohd. Yakub, Member, Council of State.
59. Sir Chunnilal V. Mehta, K.C.S.I.
60. Dr. Sir S. S. Bhatnagar, Director, Scientific and Industrial Research, Calcutta.
61. Raja Jagannath Baksh Singh, M.L.C. (U. P.).
62. Dr. T. E. Gregory, D.Sc., Economic Adviser to the Government of India.
63. Diwan Bahadur K. Chengappa, Coorg.

The Secretary, Imperial Council of Agricultural Research, *Secretary*.

Secretariat Office of the Imperial Council of Agricultural Research.

Mr. P. M. Kharegat, C.I.E., I.C.S., Principal Administrative Officer and Vice-Chairman.

Dr. W. Burns, C.I.E., D.Sc., Agricultural Commissioner with the Government of India.

Mr. F. Ware, C.I.E., F.R.C.V.S., I.V.S., Animal Husbandry Commissioner with the Government of India.

Mr. S. Basu, O.B.E., I.C.S., Secretary.

Mr. S. C. Roy, M.Sc., B.Sc. (Lond.), Dip. Agri. (Wye), Dip. I.A.R.I., Assistant Agricultural Commissioner with the Government of India.

Mr. R. L. Kaura, B.V.Sc., M.R.C.V.S., Assistant Animal Husbandry Commissioner with the Government of India.

Khan Sahib Bazlul Karim, Superintendent. (On leave preparatory to retirement).

Mr. S. C. Sarkar, B.A., M.R.A.S., Chief Superintendent. (General).

Mr. T. S. Krishnamurti, B.A., Superintendent. (Agriculture).

Mr. Shamsuddin, Officiating Superintendent.

Heads of Subordinate Officers.

Mr. A. M. Livingstone, M.C., M.A., B.Sc., Agricultural Marketing Adviser to the Government of India.

Mr. R. C. Srivastava, O.B.E., B.Sc., Director, Imperial Institute of Sugar Technology.

Research Officers at Headquarters.

Rao Bahadur Y. Ramachandra Rao, M.A., F.E.S., Locust Research Entomologist.
Dr. P. V. Sukhatme, D.Sc., Ph.D. (Lond.).
Mr. F. M. de Mello, B.A., B.Sc. (Econ.).

APPENDIX II.

Summary of decisions taken by the Governing Body at their meeting held in August 1940.

Agenda No.

A.—GENERAL RECOMMENDATIONS—

1 Statement of the financial position of the Imperial Council of Agricultural Research.

Recorded.

3(*a*) Constitution of a Standing Finance Committee under section 7 of the Agricultural Produce Cess Act, 1940 and consideration of draft rules regarding its constitution, functions and procedure.

Approved subject to certain modifications.

3(*b*) Consideration of the Imperial Council of Agricultural Research Reserve Fund and regulation of Expenditure Rules 1940 to be framed by the Central Government under Section 9 of the Agricultural Produce Cess Act.

The Governing Body had no comments to offer.

3(*c*) Proposal to exclude (*i*) manufactured drugs and (*ii*) human bones exported as anatomical specimens from the scope of the schedule of the Agricultural Produce Cess Act.

The Governing Body agreed to the proposal.

4 Reconstitution of Standing Committees.

The Governing Body decided that all the standing Committees except the Sugar Committee and the Editorial Committee should be disolved and that a Central Agricultural and Livestock Economic Committee should be set up from 1st October 1940.

5 Consideration of the question whether appointments to posts sanctioned in connection with the Council's schemes under the administrative control of the Provinces should be made on the advice of the Federal Public Service Commission or the Provincial Public Service Commissions.

The Governing Body decided to postpone consideration of the question until the next year; in the meantime the past practice should continue.

6(*a*) Acceptance of a donation of Rs. 10,000 from Mr. Lalchand Hirachand of Bombay for work at the Ravalgaon Sugar Factory under the scheme of research on the manufacture of sugarcandy.

The Governing Body gratefully accepted the donation and approved of the consequential modifications in the scheme.

6(*b*) Proposal (i) for the waiving of the recovery of certain payments of 'retiring allowances' made to the staff employed under the Council's research schemes at the Indian Institute of Science, Bangalore and (*ii*) for the delegation to the Vice-Chairman, Imperial Council of Agricultural Research of power to write off irrecoverable amounts up to a maximum of Rs. 1,000 in any individual case.

The proposals were agreed to.

6(*c*) Consideration of the proposals from the Government of Madras to share with the Council the receipts accruing from the Madras Fruit Research Scheme.

The Governing Body decided that the receipts should be divided between the Provincial or State Governments concerned and the Council in the same ratio as the recurring expenditure is shared by them and that the same principle should apply to the Madras Fruit Research Scheme with effect from 1st April 1940.

6(*d*) Consideration of the question whether the scheme for the manufacture of cattle feed from molasses, already approved by the Governing Body, should be financed from the special grant for sugarcane research or from the general research funds of the Council.

It was decided to refer this to the Economic Committee.

Agenda No.

A.—General Recommendations—*contd.*

6(*e*) Consideration of the question of postponement *sine die* of the affiliation of the Imperial Council of Agricultural Research to the International Dairy Federation on account of War conditions.

The Governing Body approved the proposal that the question of affiliation be postponed and the amount already sanctioned be resumed.

6(*f*) Consideration of excess expenditure incurred on the travelling allowance of 'visitors' during 1939-40 and consideration of the question of increasing the grant from Rs. 6,000 to Rs. 12,000.

The Governing Body sanctioned the excess expenditure amounting to Rs. 8,076-12-0 incurred on the travelling allowance of visitors during 1939-40.

6(*g*) Details of expenditure incurred from the miscellaneous grant of the Council's budget during 1939-40 and consideration of the question of increasing the grant from Rs. 2,000 to Rs. 3,000 per annum.

The statement was recorded and the Governing Body raised the grant from Rs. 2,000 to Rs. 3,000 per annum.

6(*h*) Consideration of the note on the premature termination of (*i*) the Central Provinces and Berar citrus research scheme and (*ii*) Bombay sunn-hemp scheme.

The Governing Body approved of the action taken by the Provincial Governments.

6(*i*) Approval of the action taken by the Vice-Chairman in sanctioning subject to the confirmation of the Governing Body, a year's extension to the scheme for research on the chemistry of sugarcane at the Imperial Agricultural Research Institute out of the savings from the original grant.

The Governing Body approved of the action taken by the Vice-Chairman in sanctioning a year's extension to the scheme at a cost of Rs. 2,600 to be met from likely savings in the scheme.

8 Draft Annual Report of the Imperial Council of Agricultural Research for 1939-40.

Approved.

B.—Research Schemes.

No.	From whom received.	Nature of scheme.	Amount asked for	Period in years.	Recommendations of the Advisory Board.			Decision of the Governing Body.		
					Grant by the I. C. A. R.	Period in years.	Remarks.	Grant by the I. C. A. R. (sanctioned.)	Period.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
	(a) Agricultural schemes.									
1	Bengal . . .	Rice Research . . .	56,160	4	16,650	1½	.....	16,700	1½	Extension sanctioned up to 31st March 1942.
2	Bihar . . .	Do.	64,496	2	22,050	1½	.....	22,100	1½	Ditto.
3	Orissa . . .	Do.	76,695	3	24,300	1½	Includes Rs. 1,400 sanctioned by V. C. out of amount available within sanctioned grant for expenditure prior to 1st October 1940.	31,900 24,300	1½	Ditto.
4	Assam . . .	Do.	58,200	4	14,700	1½	.....	14,700	1½	Ditto.
5	Central Provinces and Berar.	Do.	6,000	1	4,000	1	.....	4,000	1	Ditto.
6	Imperial Agricultural Research Institute.	Breeding rust resistant wheats, Simla.	39,015	5	39,000	5	.....	30,000	4	Ditto.
7	Dr. Mehta, Agra University	Rust of wheat and barley .	58,314	3	35,100	2½	.....	18,400	1	Less Rs. 11,500 savings.
8	Imperial Agricultural Research Institute.	Potato breeding . .	84,800	5	77,900	4½	.....	77,900	4½	
9	Madras . . .	Sunn hemp . . .	1,000	2	750	1½	.....	750	1½	
10	Bengal . . .	Fruit Research . .	15,912	2	1,500	5/12	.....	1,500	5/12	Less savings Rs. 400.
11	Bengal . . .	Soil problems . . .	13,000	2	11,400	1½	.....	11,500	1½	Less savings Rs. 2,4000.
12	Indian Institute of Science, Bangalore.	Cheap synthetic manure .	11,100	2	7,700	1½	Figures provisional.	7,700	1½	
13	Bengal (Col. Chopra) .	Medicinal plants and the study of food poisons.	32,305	3	24,800	2½	.....	24,800	2½	
14	Imperial Agricultural Research Institute.	Botanical Sub-station, Pusa	1,63,307	5	16,000	½	.....	16,000	½	To be met from savings.

No.	From whom received.	Nature of scheme.	Amount asked for	Period in years.	Recommendations of the Advisory Board.			Decision of the Governing Body.		
					Grant by the I. C. A. R.	Period in years.	Remarks.	Grant by the I. C. A. R. (sanctioned.)	Period.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
	(a) Agricultural schemes —contd.									
		Virus disease . . .	5,000	...	5,000	...	.....	5,000	...	Non recurring.
15	Bombay . . .	Model project for improvement in cotton cultivation in Surat District.	2,456	3	...	...	Not placed before the Advisory Board	2,500	3	New scheme.
15(*a*)	Bombay . . .									
	(b) Animal husbandry schemes.									
16	Mysore . . .	Jone's disease . .	5,000	2	2,500	1	.....	2,500	1	
17	United Provinces (Dr. Slater.)	Goat breeding . . .	38,325	5	18,500	5	.....	18,500	5	
18	Bengal (Calcutta University.)	Fresh water fishes . .	15,506	3	6,472	2 1/6	.....	6,500	2 1/6	
19	Punjab . . .	Angora goat breeding .	25,300	5	26,120	5	.....	26,120	5	New scheme.
20	Bombay . . .	Wool analysis laboratory .	6,600	3	5,880	3	.....	5,900	3	Ditto.
21	Bombay . . .	Sheep breeding additional sub-stations.	25,500	3	6,920	3	.....	6,900	3	
22	Bombay . . .	Purchase of extra Deccan Plateau sheep.	5,420	...	4,820	...	Non-recurring .	4,700	...	Non-recurring.
23	All Provinces of Hyderabad.	Veterinary Investigation .	4,18,400	4	4,18,400	4	Figure provisional .	1,04,700	1	Less Rs. 67,700 to be met from savings.
	(c) Sugar schemes.									
24	Imperial Institute of Sugar Technology.	Treatment of sugar factory effluents and conversion of molasses into manure.	12,300	2	4,000	2	.....	4,000	2	New scheme.
25	Imperial Institute of Sugar Technology.	Factory forming the basis of grading of *gur* and *rab*.	10,000	3	10,000	3	.....	10,000	3	Ditto.
26	Agricultural Marketing Adviser.	Grading of *gur* and *bura* .	3,100	1	3,100	1	.....	3,100	1	Ditto.

27	Sind . . .	Sugarcane research . .	45,000	5	28,000	5	.....	14,800	3	Ditto.
28	Aligarh University .	Biology of sugarcane insect pests.	6,800	2	3,900	2	Figures provisional	3,900	2	Ditto.
29	Imperial Institute of Sugar Technology.	Research and Testing Station, Bilari,	76,300	2 7/12	81,800	2 7/12	.....	81,800	2 7/12	Less Rs. 8,000 to be met from savings.
		(*a*) extension (*b*) publicity of the results of research.	7,240	3 3/4		1/12			1 1/6	
30	Bihar . . .	Retention of the post of Statistical Assistant at the sugarcane research station, Pusa.	3,700	2	3,600	2	.....	3,600	2	To be met from savings.
	(*d*) *Cold Storage, Marketing and General Schemes.*									
31	All Provinces . .	Provincial marketing	1,80,000	1	1,80,000	1	.....	1,80,000	1	To be met from special Marketing grant.
32	Punjab . . .	Cold storage . .	14,250	5	4,775	1 2/3	.....	4,800	1 2/3	To be met from special grant for cold storage.
33	I. C. A. R. . .	Statistical Section . .	1,04,820	4 3/4	84,000	4 3/4	.....	72,000	4	
34	I. C. A. R. . .	Editorial Staff for Indian Farming.	40,000	3	40,000	3	.....	35,500	2 2/3	
35	I. C. A. R. . .	Contribution to Tobacco Federation.	400	3	400	3	.....	400	3	
36	Entomological Society.	Grant	1,500	3	1,500	3	.....	1,500	3	

Decisions of the Governing Body at their meeting held in December 1940.

Agenda No.

A.—General Recommendations—

1 Statement of financial position.

Recorded.

2 Policy regarding contributions to the Reserve Fund.

The Governing Body accepted the recommendation of the Standing Finance Committee that no contributions should be made to the Reserve Fund this year owing to the abnormal conditions created by the War.

3 Proposal for exempting the Defence Department from the payment of export duty under the provisions of the Agricultural Produce Cess Act, 1940 on rations exported out of India by that Department.

The Governing Body accepted the recommendations of the Standing Finance Committee that exemption should be granted for the duration of the war subject to the condition that the Defence Department agreed to make an annual contribution of 30,000 rupees to the Council or of an amount that would otherwise be payable under the Cess Act.

4 Proposed increase in the grant of travelling allowance to visitors (Members of Committees.)

The Governing Body sanctioned a provision of Rs. 24,000 a year for the travelling allowance of visitors.

8 Absorption of the post of Assistant Accountant, Imperial Council of Agricultural Research in the permanent cadre of the Secretariat of the Council.

Approved.

9 Payment of travelling allowance to non-official members of the Board of Agriculture and Animal Husbandry in India nominated by the Vice-Chairman, Imperial Council of Agricultural Research.

The Governing Body sanctioned a provision of Rs. 1,000.

B.—Research Schemes.

No.	From whom received.	Nature of scheme.	Amount asked for	Period in years.	Recommendations of the Advisory Board.			Decision of the Governing Body.		
					Grant by the I. C. A. R.	Period in years.	Remarks.	Grant by the I. C. A. R. (sanctioned).	Period.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
	(a) Agricultural schemes.									
1	Madras . . .	Study of rice growing conditions.	3,500	½	...	...	Not recommended .	...	...	Not sanctioned.
	Punjab . . .	Control of wheat rusts	23,480	3	...	...	Do. .	...	...	Do.
3	United Provinces .	Breeding rust resistant varieties of wheat and barley.	32,594	5	...	...	Do. .	...	...	Do.
4	Punjab . .	Cereal Technologist for wheat research.	32,760	5	16,380	5	.....	16,380	5	
5	Bombay . . .	Improvement of *Jowar* crop	1,33,075	5	...	...	Not recommended .	...	...	Not sanctioned.
6	Central Provinces .	Commercial utilisation of linseed fibre.	15,860	3	15,860	3	.....	11,250	3	On condition that (i) the cost be shared between the Council and Provincial Government in the ratio of 3 : 1 and (ii) the latter bear the conveyance allowance of the officer-in-charge if sanctioned.
7	Madras . . .	Pollu and other diseases of pepper.	28,276	5	...	...	Not recommended .	...	...	Not sanctioned.
8	United Provinces .	Castor improvement .	39,490	5	...	...	Do. .	...	...	Do.
9	Sind . . .	Research on pulses . .	75,400	5	14,500	5	.....	8,500	5	
10	Bombay . . .	Research on pulses . .	41,360	5	22,750	5	.....	22,000	5	
11	United Provinces .	Black tip disease of mango	25,633	3	25,633	3	Figures provisional.	...	...	Sanctioned.

No.	From whom received.	Nature of scheme.	Amount asked for	Period in years.	Recommendations of the Advisory Board.			Decision of the Governing Body.		
					Grant by the I. C. A. R.	Period in years.	Remarks.	Grant by the I. C. A. R. (sanctioned.)	Period.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
	(a) Agricultural schemes —contd.									
12	North-West Frontier Province.	Fruit and Vegetable drying.	44,940	5	34,500	5	.....	...	...	Sanctioned without any specific financial commitment and subject to strict economics being effected.
13	Coorg . . .	Oranges	33,350	5	33,350	5	.....	33,350	5	
14	Benares Hindu University.	Fruit and Vegetable preservation.	96,703	5	...	...	Not recommended .	...	...	Not sanctioned.
15	United Provinces .	Research on fruits in the plains.	43,750	5	...	...	Do.	...	...	Do.
16	Punjab . . .	Contribution to Punjab Fruit Journal.	5,000	5	...	...	Do.	...	...	Do.
17	Sind . . .	Extension of fodder crop .	45,860	5	...	...	Do.	...	...	Do.
18	Bombay . . .	Central grassland Research Station.	40,740	7	...	...	Do.	...	...	Do.
19	Sind . . .	Berseem Crop . . .	21,700	5	...	...	Do.	...	...	Do.
20	United Provinces .	Mixed farming . .	2,61,213	...	17,101	5	.....	12,780	5	
21	North-West Frontier Province.	Do. . . .	8,996	...	11,400	5	.....	13,520	5	
22	Orissa . . .	Do. . . .	8,640	...	14,250	5	.....	8,850	5	
23	Sind . . .	Do. . . .	1,25,000	...	8,550	5	.....	12,350	...	
24	Central Provinces and Berar.	Do. . . .	36,000	5	18,000	5	Figures provisional.	18,000	5	
25	Bombay . . .	Crop forecast improvement	61,500	3	...	...	Not recommended .	...		Not sanctioned.
26	I. C. A. R. . .	All-India Soil Survey .	2,31,220	5	4,25,000	5	.....	85,000	2	
27	I. C. A. R. , .	Monograph on rice breeding and genetics in India.	10,000	1½	10,000	1½	.....	10,000	2	

28	I. C. A. R. . .	Monograph on composting of Farm and town waste in India.	1,000	...	1,000	...	.....	1,000	...	
29	I. C. A. R. . .	Botanical Sub-station at Pusa.	See decision of the Governing Body, August 1940.					...	...	Extension up to 31st March 1942 sanctioned.
30	Dr. K. C. Mehta of the Agra University.	Rusts of wheat and barley	See decision of the Governing Body, August 1940.					...	...	Extension up to 31st March 1943; sanctioned.
31	Baluchistan . .	Fruit canning . . .	9,521	3	...	...	Not recommended .	...	...	Not sanctioned.
32	Bombay . . .	Geological study of forest gram.	...	...	3,220	5	.....	3,220	5	Sanctioned.
33	United Provinces .	Fodder and grazing . .	...	...	44,400	5	.....	44,400	5	Do.
34	United Provinces .	Utilisation of linseed fibre .	33,000	3	...	...	Not recommended .	...	...	Not sanctioned.
35	United Provinces .	Brewing qualities of barleys	...	...	8,600	3	.....	...	...	Scheme to be suspended during the war.
	(b) Animal husbandry schemes.									
36	Imperial Veterinary Research Institute.	Damage caused by ticks to hides skins and extension of warble fly scheme.	47,000	5	47,000	5	.....	47,000	5	
37	Punjab . . .	Livestock investigation at Government cattle farms Hissar.	1,71,000	5	15,960	5	.....	15,950	5	
38	Punjab . . .	Nutrition requirements of milch cows.	5,800	3	5,150	3	.....	5,150	3	
39	Imperial Veterinary Research Institute.	Artificial in semination of livestock.	95,000	5	55,700	5	.....	55,700	5	
04	Madras . . .	Improvement of Kangayam breed of cattle.	99,868	10	58,432	10	.....	35,000	6	
41	North-West Frontier Province.	Production of lambs with Karakul Pelts.	25,600	5	24,600	5	.....	24,600	5	
42	Bihar . . .	Sheep breeding . .	25,430	5	13,365	5	.....	...	...	Sanctioned.
43	Central Provinces and Berar.	Poultry Disease . .	10,600	5	10,600	5	.....	6,360	3	
44	Punjab . . .	Do. . . .	8,850	5	8,850	5	.....	5,320	3	

No.	From whom received.	Nature of scheme.	Amount asked for	Period in years.	Recommendations of the Advisory Board.			Decision of the Governing Body.		
					Grant by the I. C. A. R.	Period in years.	Remarks.	Grant by the I. C A. R. (sanctioned.)	Period.	Remarks.
1	2	3	4	5	6	7	8	9	10	11
	(b) *Animal husbandry schemes*—contd.									
45	Hyderabad . .	Poulty Disease . .	10,600	5	10,600	5	.....	6,360	3	
46	Assam . . .	Do. . . .	10,600	5	10,600	5	.....	6,360	3	
47	Director of Dairy Research.	Detection of adulterants in ghee.	11,600	2	11,600	2	.....	11,600	2	
48	United Provinces .	Reserach work on ghee .	20,000	3	...	...	Not recommended .	...	...	Not sanctioned.
49	Dr. B. K. Sinh, Patna University.	Research on *dahi* . .	8,400	3	...	...	Do. . .	...	...	Do.
50	I. C. A. R. . .	Creation of post of milk recording Assistant.	3,000	2	2,100	1½ years from 2-1-41 to 31-3-42	.....	2,100	1 1/8	Sanctioned.
51	Bombay . . .	Drying of grass . .	14,800	3	14,800	3	.....	7,400	3	
52	I. C. A. R. . .	Monograph on Animal nutrition in India.	6,530	1	6,530	1	.....	6,530	1	
53	I. C. A. R. . .	Monograph on rinder-pest in India.	6,450	1	6,450	1	.....	6,450	1	
54	I. C. A. R. . .	Monograph on the anatomy of ox.	8,600	2	7,400	2	.....	7,300	1	
55	Imperial Veterinary Research Institute.	Systematic protozoologist .	55,000	5	...	...	Post recommended to be made permanent on the staff of the I. V. R. I.	...	...	Recommendation accepted.
56	All Provinces Hyderabad.	Veterinary Investigation Officer.	See Governing Body		August.	...	.....	...	...	Decided that the provinces and states should be informed that after 31st March 1942, cost should be divided equally between Council and Provinces.

57	Madras . . .	Rural pisciculture . .	...	...	47,800	5	.....	47,800	5	
58	Imperial Veterinary Research Institute. (c) *Sugar schemes.*	Cattle feed from molasses .	...	...	55,000	5	.....	...	...	Sanctioned Rs. 10,000 for preliminary experiments from the special grant for sugarcane research.
59	United Provinces and Bihar. (d) *General cold storage and Marketing.*	Cereal stations for sugarcane research.	...	...	...	...	Considered by a special sub-committee in August 1940. Not recommended.	65,000 76,000 76,000	1941-42 1942-43 1943-44	Subject to certain conditions. Not sanctioned.
60	Science and culture, Calcutta.	Grant	Not specified							
	Current Science, Bangalore.	Do.	500 per annum.	...	...	..	Ditto . .	...	...	Ditto.
	National academy of Sciences.	Do.	1,000 per annum.	...	...	...	Ditto . .	...	...	Ditto.
61	Provinces . . .	Marketing schemes . .	See Governing Body		August.	..	....	..	..	Allotments sanctioned as follows: Madras, Bengal, Bombay, United Provinces, Punjab, Bihar and Central Provinces Rs. 14,500 each. Sind, Assam and Orissa Rs. 13,500 each. North-West Frontier Province Rs. 10,000.

APPENDIX III.

Summary of important recommendations made by the Advisory Board at its meetings held in June 1940 and November 1940.

June 1940.

(Schemes which have gone to the Governing Body either in August or December have been omitted from this list).

Agenda No.	Subject.	Recommendation.
4 (*i*)	Co-ordination of research and collaboration between research workers.	(*a*) Provinces and States should encourage their research staff to see the work in progress in other areas. (*b*) The lines along which scientific work is being conducted in connection with a particular subject should be periodically studied at a meeting of workers on the subject who might be members of a sub-committee of the committee set up by the Council for that subject. (*c*) Further work to be done at each place may be examined by such sub-committees and suitable co-ordinated place or work drawn up for the guidance of the different officers.
4 (*ii*)	Supply of improved seeds . .	(*a*) Provinces and States should undertake the preparation of periodical lists of their own improved strains and seeds and furnish them to the Council for consolidation and circularisation to its constituents. (*b*) They should supply their improved strains to the Agriculture Department of other Provinces and States on request for trial there at a reasonable price, whenever feasible and they should take precautions to see that no diseases and pests are allowed to be propagated in this way.
7	Technical Publications of the Imperial Agricultural Bureaux.	The Publications should be made more available to research workers.
17 (*i*)	Proposal for the grant of a special pay to Dr. P. K. De for supervising the work connected with the soil research scheme.	Rejected.
17 (*iii*) & 17 (*iv*)	Determination of deficiencies in Indian soils with respect to minor and trace elements; and microbiological studies of Indian soils.	Applications for financial assistance, that might be received from Universities should be sympathetically considered.
17 (*vi*)	Soil conservation in the Upper Shillong Farm, Assam.	The Director of Agriculture, Assam might send an article on the subject to the Indian Farming.
21 (*i*)	Pan disease in Surma Valley . .	The Director of Agriculture, Assam, should get into touch with the Imperial Mycologist and workers in other Provinces to find out methods of controlling the disease.
21 (*ii*)	Further research on pests and diseases of oil-seeds.	Further information should be obtained.

Agenda No.	Subject.	Recommendation.
32	Dr. Pal's note on the variability in wheat.	The note should be published by the Council after it had been modified by Dr. Pal in the Light of the recommendations of the Committee on the subject.
34 (*i*)	Potato production in India . .	The Agriculture Departments should explore the possibility of organising schemes for the distribution of seed potatoes of improved varieties of good quality and see to what extent it would be possible for them to arrange to grow more potatoes particularly for supply to the Calcutta Market from July to November.
43 (*i*)	*Pulses* . . . . . (*a*) Research on the cultivation of pulses.	Agricultural Commissioner should prepare a note regarding future work on pulses throughout India and statistics of the area under each of the pulses in different Provinces and States and their production should be obtained through the Directors of Agriculture.
43 (*ii*)	Place of pulses in mixed croping .	Madras Government might put up a scheme and suitable experiments should be laid down at all Agricultural stations where pulses were an important crop.
43 (*iii*)	Position of pulses in Commerce .	The Marketing Staffs should collect statistics regarding total production and the proportion going to the market.
47 (*iv*)	Special pay for Dr. P. K. Sen, Officer-in-Charge, Bihar Fruit Research Scheme.	The matter might be settled by the Vice-Chairman in consultation with the experts and the Government of Bihar.
47 (*v*)	Note by the Agricultural Commissioner on Fruit Research work.	This should be discussed at a horticultural Workers' Conference.
49 (*iv*)	Extension of the term of the Imperial Institute of Sugar Technology.	The Institute should be made permanent on the expiry of its present term.
52 (*iv*)	Note by the Agricultural Commissioner on the control of insect pests of sugarcane.	The note should be brought to the notice of all sugarcane research workers.
52 (*v*)	Experiments on the use of molasses and press mud as manure.	This should be linked up with the scheme for helping in the installation of large scale plant for sugar factory effluents.
52 (*vi*)	Statements regarding (1) the average yield of sugarcane per acre and (2) the average gur/cane ratio.	Provinces and States should furnish the information on the form proposed by the Director General, Commercial Intelligence and Statistics.
52 (*vii*)	Question of devising a system to enable factories to take initiative in helping the cultivators in increasing the yield of cane.	Collaboration between Agricultural Departments and research workers and factories should be developed.
52 (*viii*)	Supply of proceedings of the Sugar Committee to the Indian Sugar Syndicate and others.	A copy of the agenda and proceedings of the committee meetings might be supplied to the syndicate for their official and confidential use.
52 (*ix*)	Problem of the over production of sugarcane.	A copy of the speech made by Raja Jagganath Bakhsh Singh at the meeting should be forwarded to the Government of India.

Agenda No.	Subject.	Recommendation.
52 (*x*)	Note by the Director of Agriculture, Bihar on— (*a*) Insect pests in general (*b*) Pyrilla circular and (*c*) Red Rot and	These notes should be placed before the special entomological committee at the next meeting.
52 (*xi*)	Note by the Director, I. A. R. I. on the results of 3 years experiments on biological control of sugarcane pests.	
52 (*xii*)	Importation of sugarcanes from foreign countries by the Imperial Sugarcane Specialist, Coimbatore.	Exchange of sugarcane varieties between Coimbatore and Foreign stations should be on a basis of strict reciprocity.
54-A (*i*)	Bunding experiments in Dry Farming Research.	The data on the setaria and sorghum varieties should be collected from all the dry farming stations and examined by the Statistician, I. C. A. R. Experiments on setaria and sorthum should be dropped in future.
55 (*i*)	Co-ordination of research on Fodder and Grazing.	The recommendations of the Fodder and Grazing Committee with certain changes suggested at the Board should be brought to the notice of all concerned.
56 (*i*)	Other matters concerning Fodder and Grazing— (*a*) Cultivated Fodders (*b*) Literature (*c*) Star-grass.	Dr. Sen's note in regard to concentrates awaited. Literature between Provinces and States should be exchanged on a basis of reciprocity. Mr. Boshi Sen should get into touch with Mukteswar for testing the toxic properties of this grass.
57A (*i*)	Pamphlet entitled Agricultural Propaganda in India.	The Director of Agriculture might take a note of the suggestions and try to give effect to them.
58 (*iv*)	Madras Government Breeding Scheme.	The Animal Husbandry Commissioner might revise the scheme restricting it to the Malabar Government only. The revised scheme should then be submitted to the Governing Body.
60 (*i*)	Dr. Makhijani's scheme for insemination of livestock.	The schemes from Provinces should be considered after the Imperial Veterinary Research Institute's scheme on the subject had been in operation for two years.
60 (*ii*)	Definition of the breed characteristics of the Tharparkar breed—Khan Sahib Ulvi's report.	The members of the Animal Breeding Committee should be invited to send in criticisms which should be suitably dealt with by the Animal Husbandry Commissioner and placed before the next Advisory Board Meeting.
31 (*i*)	Scheme from the United Provinces to investigate the relation between the nutritive value of cultivated fodders and the soils on which they grow.	Scheme should be examined by a small expert committee and put up to the Board at the next meeting.

Agenda No.	Subject.	Recommendation.
66 (*ii*)	Report by Colonel Sir Arthur Olver on the International Veterinary Congress held at Zurich in August 1938.	The Board adopted certain resolutions in regard to the revision of syllabuses of Veterinary Colleges, etc.
67 (*ii*)	Animal Welfare Work . . .	(*a*) There should be properly equipped livestock research stations in every Province and State. (*b*) Work at such stations might be co-ordinated by an existing organisation at the centre.
68 (*iv*)	Dr. Banerji's scheme of research on (*a*) methods of manufacture of ghee and (*b*) the properties of ghee as dependent on manufacture.	The Indian Institute of Science should be requested to send a revised scheme as recommended by the Dairying Committee.
72 (*i*)	Review of Fishery Research in India.	(*a*) A Fish Committee should be set up. (*b*) The Provincial Governments which have no fisheries Department should set up an efficient organisation to survey the work. (*c*) Provincial Governments should provide facilities for fishery research as far as possible.
72 (*i*)	Production of cod liver oil substitute.	The matter should be referred to the appropriate Department of the Government of India.
74 (*i*)	Sampling technique . . .	The promised data by Rao Bahadur Viswanath should be referred to Professor Mahalanobis and thereafter circulated to members of the Statistical Committee.
77	I. C. A. R. publications . . .	(*a*) Provincial Governments should be asked to expedite reports and to send manuscript copies earlier to the Council. (*b*) Move Scientific Monographs and Bulletins should be brought out. (*c*) The volume of "The Agriculture and Animal Husbandry in India" should be reduced.
5	Request from the Inter-University Board for a suitable grant to Patna University for research on Problems of Physics and Chemistry connected with Agriculture.	A reply should be sent to Patna University that if they sent up schemes they would be considered on their merits.
	November 1940.	
3	Preparation of a list of subjects suitable for research at Universities.	The Board recommended the appointment of a small committee to put up suitable concrete suggestions.
4	Security of tenure for the research staff of the Imperial Council of Agricultural Research.	The Secretariat of the Council should put up a detailed scheme.

Agenda No.	Subject.	Recommendation.
4-B	Co-ordination of research and collaboration between research workers.	The Provincial Governments and States should be circularised to encourage and provide facilities for their research officers to tour other centres where similar work was in progress.
7 (*i*)	Scheme for Dry Farming on red soils at Anantapur at Madras.	Recommended with certain modifications.
10 (*ii*)	Anti-erosion Committee . .	Preliminary data should be collected in the first instance in conjunction with the soil survey scheme.
10 (*iv*)	Methods of combining the yields of grain and straw into a single analysis.	The results should be shown in the form proposed with certain additional suggestions.
10 (*v*)	All-India Soil Survey . . .	First part of the scheme namely the collection of data by a central officer and a number of provincial officers should be proceeded with.
11 (*i*)	Phytophthora Scheme, Madras .	The scheme should be referred back for revision.
11 (*iii*)	Helminthosporium Scheme, Sind .	The Provincial Government may be requested to send up a revised scheme.
11 (*iii-a*)	Helminthosporium Scheme, Bengal .	Not recommended.
11 E (*iii-b*)	Insect pests of Paddy scheme, Bengal.	Recommended subject to certain modifications.
12	Control of Wheat Rusts . . .	The proposed work in the Punjab should be dropped and Madras Government should be approached to send up a suitable scheme.
15 (*i*)	Rice-breeding for salt lands, Bombay	The consideration of the scheme should be postponed pending a general survey of rice cultivation in coastal regions.
15 (*ii*)	United Provinces Tobacco scheme .	Consideration postponed pending formulation of a programme of co-ordinated research by the Agricultural Commissioner with the Government of India.
15 (*vi*)	United Provinces Pulses scheme .	Not considered in view of item regarding separate proposals for co-ordinated research on pulses.
15 (*vii*)	Central Provinces Pulses scheme .	Not considered in view of item regarding separate proposals for co-ordinated research on pulses.
15 (*viii*)	Research on small millets . .	Consideration postponed pending formulation of a programme of co-ordinated research by the Agricultural Commissioner with the Government of India.
15 (*ix*)	Research on rabi juar, Central Provinces.	Not recommended.
15 (*x*)	Breeding of Jola, Mysore . .	Not recommended.
15 (*xi*)	Clove cultivation, Madras (General question of starting co-operative experiments in cloves.)	Experiments on cultivation of cloves should be undertaken.
15 (*xiii*)	Turmeric Research, Orissa . .	The Provincial Government should submit a revised scheme.
15 (*xv*)	Sind grassland scheme . . .	Consideration should be postponed till the scheme for investigations in non-forest lands was received.

Agenda No.	Subject.	Recommendation.
		General Remarks.
18 (*i-iia*)	Central Provinces Rice Report. United Provinces Rice Report. Bengal Rice Report.	The Director, I. A. R. I., should be requested to permit the Imperial Economic Botanist to inspect the rice schemes in progress at an early date so that his report might be available before the Advisory Board in April 1941.
19 (*i*)	Co-ordinated research on pulses .	Proposals recommended with certain modifications.
19 (*ii*)	Desirability of increasing intake of pulse.	The advisability of growing more pulses should be brought to the notice of Provincial Governments.
19 (*iii*)	Use of soya bean as concentrated ration.	The success of consumption of soya beans and its products depended on processing which was a task for the Industrial Research Bureau.
26 (*iii*)	Appointment of an Imperial Horticulturist.	A recommendation should be sent up to the Government of India for the appointment of an Imperial Horticulturist.
26 (*iii-d*)	Score cards	Methods of judging important fruits including the use of score cards should be included in the Agenda of the next horticultural research worker's conference.
26 (*iii-e*)	Classification of fruits . . .	A tentative schedule of characters on mangoes would be drawn up by the agricultural Commissioner.
26 (*iii-f*)	Horticultural Journal . . .	Illustrated articles of a popular nature on horticultural subjects should be published in the Indian Farming.
26 (*iv*)	Facilities for visiting other centres of research.	Provinces and States should be requested to permit their research workers to visit research stations in other Provinces and States.
27 (*iii*)	Central Station for sugarcane research for S. D. Padegaon—Scheme from Bombay Government.	Consideration of the proposal should be postponed.
27 (*iv*)	Appointment of a Physiologist at Coimbatore—Scheme from the Dir. I. A. R. I.	The appointment was recommended for sanction, the details of work to be done should be gone into when the technical programme is received.
28 (*i*)	Scheme for breeding of suitable types of canes for Gujrat —Extension of Baroda State scheme.	Full details of the programme of work should be called for, and pending its receipt consideration of the extension scheme should be postponed.
28 (*iii*)	Additional staff for the sugarcane research scheme, N.-W. F. P.	The application for additional staff was not granted.
28 (*iv*)	Date of termination of different Centres of the regional section of the scheme for research on insect pests of sugarcane.	The Board recommended the continuance of regional stations till 30th September 1941 pending examination of the working of the scheme by a Special Sub Committee to be appointed by the V. C., I. C. A. R.
29 (*i*)	Survey of yield and gur/cane ratio of sugarcane for investigation of the crop sampling technique in the U. P. Technical programme.	The Board approved the programme with certain modifications.

Agenda No.	Subject.	Recommendation.
29 (*ii*)	Scheme for research on insect pests of sugarcane at the I. A. R. I. (Central portion) —Technical Programme.	The Board approved the technical programme with certain modifications and recommended (*i*) that the observations work on major pests should be taken up in the Provinces and that a standard technique in regard thereto should be worked out at the Centre and sent to the Council for further examination before it is suggested to the Provinces, (*ii*) that a detailed programme of the work to be done in connection with midrib texture should be prepared and submitted to the Council and that it should provide for the carrying on of the work in collaboration with the Provinces where practicable. (*iii*) that a note should be written up explaining in detail the plan of work in connection with the control of parasites, the items of the programme and how they will be carried out for examination from the statistical and the entomological points of view.
29 (*iii*)	Central Stations for Sugarcane Research, U. P. and Bihar —Technical programme.	The Board accepted the programme with certain modifications.
29 (*iv*)	Sugarcane Research Scheme, N.-W. F. P.—Technical programme.	The Board recommended that the programme should be again revised in consultation with the A. C.
31 (*i*)	Note by Dr. H. H. Dodds entitled	(*i*) Report on the colotox process and (*ii*) Outline of a process of manufacture of colotox. The Advisory Board recommended that a monograph should be published by the I. C. A. R. containing information regarding the process of manufacturing colotox and other methods of production of bagasse boards, together with the results of the Dehra Dun experiments for the production of insultation and pressed boards, wrapping paper and straw boards.
31 (*iii*)	The Indian Sugar Mills Association's resolutions regarding intensification of work on improvement of sugarcane cultivation.	The Board decided that the resolutions passed by the Sugar Committee on the subject should be forwarded to the authorities concerned for their consideration.
31 (*iv*)	Resolution of Mr. Abdul Latif Beg .	This Committee recommends to the Government of the United Provinces and Bihar that the prices of sugar fixed for the season, should not go down till the next season begins. The Board recommended that this resolution be forwarded to the Governments of the U. P. and Bihar with the remarks that the Sugar Committee or the Advisory Board were not in a position to express any opinion about it.

Agenda No.	Subject.	Recommendation.
32 (*viii*)	Scheme for crop rotation in relation to nutrition.	Scheme should be referred back and a copy of Dr. Gadgil's scheme be supplied to Professor Mukerji for drawing up details of the scheme.
32 (*ix*)	Estimating yield of cinchona, Bengal	The scheme was not recommended.
32 (*x*)	Crop Cutting experiments on paddy, Bengal.	Not recommended.
33 (*ii*)	A research station for Lohani breed of cattle in Kangra district.	It was recommended that the scheme should be referred back to the Punjab Government for resubmission after obtaining information regarding the conditions in the home of the Lohani breed under which these cattle yielded such large quantities of milk.
35 (*ii*)	Initiation of Central Herd Books for breeds of cattle of all India importance.	The Board noted that Central Herd Books for the Sahiwal, Sindhi, and Hariana breeds of cattle and for Murrah buffaloes had now been established and expressed the hope that Provinces and States concerned would come forward with applications for registration in respect of these breeds.
35 (*iii*)	Definition of the breed characteristics of Khillari and Dhani breeds of cattle and Surti, Nili and Ravi breeds of buffaloes.	The breed characteristics and the photographs of Khillari, Dhani and Surti breeds intended for publication were approved with certain minor modifications. The consideration of Nili and Ravi breeds was postponed due to non-receipt of photographs.
36 (*i*)	Determination of the value of fodders for milking cattle.	The Board observed that the scheme lacked details and it was not explained where and under whom it was to be worked. Further it was doubtful whether the small dairy attached to the Agricultural College at Coimbatore would be able to provide a sufficient number of suitable animals to carry out the work visualized in the scheme. It was therefore decided not to recommend the scheme for adoption.
36 (*ii*)	The replacement of high priced grains by protein rich oil cakes from the ration of milch and grewing cattle.	The scheme was not recommended because the main point of the scheme was to ascertain the extent to which oil cakes could be fed to cattle without detriment to their health and the Board observed that this might be incorporated in the investigations on the subject of feeding oil cakes already in progress at Lyallpur.
40 (*ii*)	Scheme for the appointment of a parasitologist in Bihar.	The scheme was not recommended. It was observed that Bihar had not taken sufficient advantage of the facilities offered for Helminthological investigation Luc . . .

Agenda No.	Subject.	Recommendation.
43 (*ii*)	Revised scheme by Mr. B. N. Banerjee for the study of the factors on (A) the methods of manufacture of ghee, and (B) the composition and properties of.	The Board recommended the independent scheme submitted by Mr. Banerjee at a total cost of Rs. 13,580 spread over three years. The Board also desired that samples should be obtained (in consultation with the I. D. E.) from various organised dairies in India where the feeding of animals has been standardised, and from which details of the rations fed to the animals can be supplied. Any excess over the amount (Rs. 1,000 per annum) provided in the scheme for the purchase of samples should be made good by the Indian Institute of Science.
46 (*ii*)	Consideration of the problems arising in connection with the supply of milk from villages to towns.	The Board made the following recommendations on the various questions :- *Question* (*a*) (*i*).—The assembling of producers at a central place for milking their cows is necessary. *Question* (*a*) (*ii*).—Loans should be given where necessary for purchase of cattle and they should be repayable in easy instalments by recovery from payments for milk. The amount to be advanced will depend upon local conditions. *Question* (*a*) (*iii*).—Loans may also be advanced for purchasing foods under the same conditions, or as an alternative fodder might be purchased in bulk at wholesale rates and distributed to producers. *Question* (*b*).—The type of shed will depend upon local conditions. Pucca buildings may not be possible to begin with, but the aim should be to provide pucca floors and some shelter against the weather, sufficient supply of water is essential. *Question* (*c*).—It was considered that local arrangements should be made for supervision and that a paid officer will not be possible. It would however, be an advantage if it could be arranged for a member of the provincial Veterinary Department to pay a quarterly visit to collecting centres with a view to giving advice regarding the maintenance of the health of the animals. *Question* (*d*).—Whether an assembling station will be necessary, depends upon local conditions, availability of roads and means of transport. As raw milk cannot be guaranteed to remain in good conditions for more than two hours, an assembling station, will be necessary when its transport takes longer than this.

Agenda No.	Subject.	Recommendation.
46 (*ii*)	Consideration of the problems arising in connection with the supply of milk from villages to towns—*contd.*	It was observed that collecting centres more than ten miles away from a town have the advantage of avoiding competition with headloads from suburbs. As far as possible assembling stations should be avoided to reduce cost. *Question* (*e*).—Heavily tinned metal cans capable of being locked should be used. No cooling arrangements were considered necessary during transit. If an assembling station is used and the milk heated in any way it should be transmitted in hot state to the distributing station, as quickly as possible. *Question* (*f*).—The comments with the note were accepted. *Question* (*g*).—The functions of an assembling station as detailed in the note were agreed to. *Question* (*h*).—Some further investigation in regard to methods of transporting milk, particularly as regards the use of open or closed lorries, is required. *Question* (*i*).—When the milk has been pasteurised it should be cooled and kept in cold storage till delivery to customers. *Questions* (*j*), (*k*) and (*l*).—The comments in the note were accepted.
	Scheme for the establishment of a wool research station at the I. V. R. I.	The Director, I. V. R. I., should be asked to prepare a revised scheme embodying certain points brought out by the Board and Dr. Venkataraman of the Bombay University should submit a complementary scheme for the development of the technological side.
	The position of India in the carpet wool industry and steps to be taken to define the characteristics including the special characteristics of wool of the important breeds of Indian sheep.	The first essential is to survey the sheep population throughout India by a senior officer from the centre in collaboration with local officers in the various provinces and states with a view to define the characteristics of the different breeds of sheep and to evaluate their potentialities as wool producers. After the characteristics of each breed have been defined, work should commence with a view to obtain uniformity within each breed and development should be attempted in accordance with the trade requirements in different parts of the country.

Agenda No.	Subject.	Recommendation.
46 (iv)]	Consideration of the problems arising in connection with the supply of milk from villages to towns—*concld.*	The disease and pests of sheep requiring most attention from the Veterinary Department in India.
		Diseases and malnutrition are responsible for poor quality and low production of wool. Other agents causing depreciation in the value of wools are burrs and spear grass. It is suggested that most of the diseases caused by external and internal parasites can be effectively controlled by regular dipping.
		Planning research on improved methods of washing, shearing, sorting, etc. of wool and the co-ordination of such research with work on carding, combing, spinning etc. of Indian wool.
		This type of work which is already in progress at the sheep breeding farms in the Bombay Province should be extended to other sheep breeding stations in India and carried to the villages through subsidiary stations. This recommendation applies more to the shearing centres than to the villages.
		The necessity for revising the livestock census form for sheep particularly with a view to distinguish between woolly sheep and hairy sheep.
		The proposed improvement in the existing classification in the census is necessary. As a first step enquiries may be made from Provinces ann States to ascertain the various local names by which the different hairy and woolly breeds of sheep are known.
		Question of introducing classes for certain breeds of sheep into All-India Cattle Show and the maintenance of stud books for selected or pedigree rams of such breeds.
		It is desirable to include classes for sheep not only in the All-India Cattle Show at New Delhi and its regional branches, if and when these are introduced, but also in local shows in Provinces and States.
		There are, however, a number of practical difficulties, of which the question of financing, the exhibits is not the least important.
		The importance of stud books and score cards for sheep as are in vogue in other countries is realised but it is felt that at the present stage it is premature to introduce these in India except on organised farms where controlled breeding is in progress.

APPENDIX IV.

PERSONNEL OF STANDING COMMITTEES.

Sugar Committee.

1. The Vice-Chariman I. C. of A. R.—*Chiarman.*
2. The Agricultural Commissioner with the Government of India.
3. The Director, Imperial Agricultural Research Institute.
4. The Director, Imperial Institute of Sugar Technology.
5. The Imperial Sugarcane Expert, Coimbatore.
6. The Agricultural Marketing Adviser to the Government of India.
7. The Director of Agriculture, Madras.
8. Mr. Gosta Behari Pal, Agricultural Chemist, Bengal.
9. The Economic Botanist (Sugarcane) to Government, United Provinces, Shahjahanpur.
10. The Deputy Director of Agriculture (In-Charge Cane), United Provinces, Lucknow.
11. The Director of Agriculture, Punjab.
12. The Director of Agriculture, Bihar.
13. The Sugarcane Specialist, Sugarcane Research Scheme, Pusa (Bihar).
14. The Director of Agriculture, Mysore.
15. The Director of Agriculture, Bombay.
16. The Cane Commissioner, United Provinces, Lucknow.
17. The Cane Commissioner, Bihar, Patna.
18. Lala Har Sahai Gupta, B.A., M.L.C., Shankar Agricultural Farm, *Bilari* (Moradabad).
19. Pandit Hira Vallabh Tripathi, Honorary Secretary, Sugarcane Growers' Co-operative Society, Saharanpur.
20. Mr. Rajeshwar Prashad Narayan Sinha, M.L.A., Village Birsingpur, Darbhanga.
21. Nawab Malik Sir Mohammad Hayat Khan Noon, M.L.A., Lahore (Punjab).
22. Mr. Hamidul Huq Chowdhury, M.L.C., 34, Beniapukar Road, Calcutta.
23. Sri Balusu Butchi Sarvarayudu, Zamindar of Kapileswarapuram, Ramachandrapur Taluk, East Godavari District, Madras.
24. Lala Shri Ram, 20-22, Curzon Road, New Delhi.
25. Mr. D. R. Narang, Basti Sugar Mills Co., Ltd., Basti, U. P.
26. Mr. B. L. Gray, Messrs. Begg Sutherland and Co., Ltd., " Sutherland House " Cawnpore.
27. Dr. C. H. Nielson, The Saraya Sugar Factory, Sardarnagar, District Gorakhpur (U. P.).
28. Prof. V. G. Kale, Professor of Economics, Bombay University, Bombay.
29. Raja Sri Ravu Sir Swetachalapati Ramakrishna Ranga Rao Bahadur, Raja of Bobbili, Madras.
30. Mr. D. P. Khaitan, 8, Royal Exchange Place, Calcutta.
31. Mr. Walchand Hirachand, Phœnix Building, Ballard Estate, Fort, Bombay.
32. Mirza Abdul Latif Beg, Kiratarpur, District Bijnor (U. P.).
33. Mr. Jagjiwan Ujamshi Mulji, 32, Apollo Street, Bombay.
34. Mr. Satya Pal Verma.
35. Chaudhri Mukhtar Singh, Daurala Sugar Works, Daurala, Meerut.
36. The Hon'ble Mr. Hosain Imam.
37. Prof. N. G. Ranga, M.L.A. (Central) 23, Stringers Street, George Town, Madras.

the Secretary, I. C. A. R.—*Secretary, ex-officio.*

Soil Science Committee.

1. The Vice-Chariman, I. C. of A. R.—*Chairman.*
2. The Agricultural Commissioner with the Government of India.
3. The Agricultural Chemist, United Provinces.
4. The Agricultural Chemist, Punjab.
5. The Agricultural Chemist, Bihar.
6. The Agricultural Chemist, Central Provinces and Berar.
7. The Agricultural Chemist, Sind.
8. The Deputy Director of Agriculture, Orissa.
9. Lieutenant-Colonel C. A. MacLean, Deputy Director of Agriculture, Bihar.
10. Rao Bahadur B. Viswanath, Director, Imperial Agricultural Research Institute, New Delhi (*Soil Chemist*).
11. Dr. J. K. Basu, Soil Physicist, Sugarcane Research Scheme, Bombay-Deccan (*Soil Physicist*).
12. Dr. P. G. Krishna, Agricultural Chemist to the Government of Hyderabad (*Soil Physicist*).
13. Dr. E. Mackenzie Taylor, Director, Irrigation Research, Punjab (*Soil Physicist*).
14. Dr. J. C. Ghosh, Director, Indian Institute of Science, Bangalore (*Physical Chemist*).
15. Dr. J. N. Mukherjee, Professor of Chemistry, Calcutta University.
16. Mr. P. H. Carpenter.
17. Dr. Nazir Ahmad, Director, Technological Laboratory, Indian Central Cotton Committee, Bombay.
18. Dr. J. K. Dubey.
19. Mr. R. G. Allan, Commissioner of Agriculture, Baroda.
20. Dr. Sri Krishna, Bio-Chemist, Forest Research Institute and College, Dehra Dun.
21. A representative of the Department of Agriculture, Madras.

The Secretary, I. C. A. R.—*Secretary, ex-officio.*

Fodder and Grazing Committee.

1. The Vice-Chaiman, I. C. A. R.—*Chairman.*
2. The Agricultural Commissioner with the Government of India.
3. The Animal Husbandry Commissioner with the Government of India.
4. The Director of Remounts, Army Headquarters.
5. The Director of Farms, Army Headquarters, Simla.
6. The Inspector General of Forests, Forest Research Institute, Dehra Dun.
7. The Director of Dairy Research, India.
8. Dr. K. C. Sen, Officer-in-Charge, Animal Nutrition Section, Imperial Veterinary Research Institute, *Izatnagar.*
9. The Chief Conservator of Forests, *Madras.*
10. Mr. E. J. Bruen, Livestock Expert to the Government of Bombay, *Poona.*
11. Professor L. S. S. Kumar, College of Agriculture, *Poona.*
12. Mr. W. Meiklejohn, Senior Conservator of Forests, Bengal, *Darjeeling.*
13. The Chief Conservator of Forests, United Provinces, *Lucknow.*
14. The Director of Agriculture, Bihar, *Patna.*
15. The Conservator of Forests, Bihar, *Ranchi.*
16. Mr. E. A. H. Churchill, Principal, Agricultural College, *Nagpur.*
17. The Agricultural Officer, North West Frontier Province, P. O. Tarnab Farm, *Peshawar.*
18. The Director of Agriculture, Sind, *Karachi.*
19. The Deputy Director of Agriculture, Orissa, *Cuttack.*
20. The Commissioner of Agriculture, *Baroda.*

21. The Director of Agriculture, *Bhopal.*
22. Sardar Bahadur Sir Datar Singh, Montgomery Dairy Farm, *Montgomery.*

The Secretary, I. C. A. R.—*Secretary, ex-officio.*

Dairying Committee

1. The Vice-Chairman, I. C. of A. R.—*Chairman.*
2. The Animal Husbandry Commissioner with the Government of India.
3. The Imperial Dairy Expert, Bangalore.
4. The Director of Military Farms (or Representative), Army Headquarters, Simla.
5. Mr. W. Keventer, Messrs. Keventer & Co., Aligarh.
6. Mr. R. C. Woodford, Deputy Director of Agriculture (Livestock), Assam, Shillong.
7. Mr. E. J. Bruen, Livestock Expert, Bombay.
8. The Livestock Development Officer, Madras, Hosur.
9. The Director, Imperial Veterinary Research Institute, Mukteswar.
10. Mr. A. C. Aggarwala, Professor of Animal Husbandry, Veterinary College, Lahore.
11. Mr. J. V. Takle, Extra Assistant Director, Animal Husbandry, Central Provinces and Berar, Nagpur.
12. Mr. W. Sayer, Imperial Agricultural Research Institute, New Delhi.
13. Sardar Bahadur Sir Datar Singh, Montgomery Dairy Farm, Montgomery.
14. Mr. F. J. Gossip, Livestock Expert, Bengal, Dacca.
15. Dr. Burch H. Schneider, Allahabad Agricultural Institute, Allahabad.
16. Mr. D. N. Khurody, Senior Marketing Officer.
17. The Deputy Director of Agriculture, Bundelkhand Circle, Jhansi, United Provinces.
18. The Director of Veterinary Services, Bihar, Patna.
19. The Director of Veterinary Services, Bombay.
20. Dr. W. L. Davies, Director of Dairy Research, India.
21. Mr. Mohd. Azhar Ali, 131, Khialigunj, Lucknow.

The Secretary, I. C. A. R.—*Secretary, ex-officio.*

Editorial Committee.

1. Mr. P. M. Kharegat, C.I.E., I.C.S.—*Vice-Chairman.*
2. Dr. W. Burns, C.I.E., D.Sc., Agricultural Commissioner with the Government of India.
3. Mr. F. Ware, C.I.E., F.R.C.V.S., F.N.I., I.V.S., Animal Husbandry Commissioner with the Government of India.
4. Rao Bahadur B. Viswanath, F.I.C., F.C.S., Director, Imperial Agricultural Research Institute, New Delhi.
5. Dr. F. C. Minett, D.Sc., M.R., C.V.S., Director, Imperial Veterinary Research Institute, Mukteswar.
6. Dr. J. N. Mukherjee, D.Sc., Ghosh Professor of Chemistry, University College of Science and Technology, Calcutta.
7. Mr. James N. Warner, M.Sc., Offg. Professor of Animal Husbandry and Dairying, Allahabad Agricultural Institute, Allahabad.

Mr. S. Basu, I.C.S., Secretary, I. C. A. R.,—*Secretary, ex-officio.*

APPENDIX V.

Personnel of Scientific and Commodity Committees.

The Vice-Chairman, the Agricultural Commissioner, the Animal Husbandry Commissioner and the Agricultural Marketing Adviser are members of all these committees and the Secretary, Imperial Council of Agricultural Research, will be their *ex-officio* Secretary.

A.—Scientific Committees.

1. *Soil Science.*

1. Rao Bahadur B. Viswanath, Soil Chemist	I. A. R. I.
2. Dr. MacKenzie Taylor, Director, Irrigation Research Laboratory, Lahore	Punjab.
(or in his absence Dr. A. N. Puri of the same Laboratory).	
3. Dr. J. K. Basu, Soil Physicist	Bombay.
4. Dr. P. G. Krishna, Agricultural Chemist	Hyderabad.
5. Dr. Sri Krishna, Bio-Chemist	I. F. R. I.
6. Dr. D. V. Bal, Agricultural Chemist	C. P.
7. Mr. B. K. Mukerji, Agricultural Chemist	U. P.
8. Prof. J. N. Mukherjee	Calcutta University.
9. Mr. P. H. Carpenter	Assam.
10. Mr. N. V. Joshi (Microbiologist)	late of the I. A. R. I. (now retired).
11. Mr. Narayana Iyer, Director and Chemist	Travancore.

2. *Plant Mycology.*

1. Dr. G. W. Padwick	I. A. R. I.
2. Dr. B. N. Uppal	Bombay.
3. Dr. K. C. Mehta	Agra University.
4. Mr. J. F. Dastur	C. P.
5. Mr. P. K. Dey	U. P.
6. Mr. K. M. Thomas	Madras.
7. Dr. K. D. Bagchee	I. F. R. I.
8. Mr. M. J. Narasimhan	Mysore.
9. Director of Agriculture	Assam.

3. *Plant Entomology.*

1. Dr. H. S. Pruthi	I. A. R. I.
2. Mr. P. V. Isaac.	I. A. R. I.
3. Khan Bahadur M. Afzal Husain	Punjab (University).
4. Dr. K. A. Rehman	Punjab.
5. Mr. M. C. Cheriyan.	Madras.
6. Dr. C. F. C. Beeson (or his successor)	I. F. R. I.
7. Mr. Templar	Begg Sutherland.
8. Mr. Ramkrishna Aiyar	South India.
9. Dr. Mirza.	Aligarh University.
10. Director of Agriculture	Kashmir.

4. Plant Breeding (Botanical).

1.	Dr. B. P. Pal	I. A. R. I.
2.	Mr. K. Ramiah	Indore.
3.	Dr. Birbal Sahni	Lucknow University.
4.	Prof. Agharkar	Calcutta University.
5.	Dr. V. K. Badami	Orissa.
6.	Dr. T. S. Sabnis	United Provinces.
7.	Rai Sahib Jai Chand Luthra	Punjab.
8.	Rao Bahadur G. N. Rangaswamy Iyengar	Madras.
9.	Mr. Khoorsheed	Hyderabad.
10.	Dr. Hedayátullah	Bengal.
11.	Prof. L. S. S. Kumar	Poona.
12.	Director of Agriculture	Bihar.

5. Plant Physiology.

1.	Mr. Boshi Sen	Almora.
2.	Dr. R. D. Rege	Bombay.
3.	Prof. Parija, Cuttack	Patna University.
4.	Prof. Ekambaram	Madras University.
5.	Prof. R. H. Dastur	Punjab.
6.	Dr. Ramdas	Meteorologist.
7.	Mr. P. H. Carpenter	Assam.
8.	Mr. B. N. Malkani	Sind.
9.	Dr. B. N. Singh	Benares Hindu University.

6. Plant Management (Agronomy).

1.	Prof. Mahalanobis	Calcutta University.
2.	Mr. Kanitkar	Bombay.
3.	Mr. J. C. McDougall, Director of Agriculture	Central Provinces.
4.	Mr. Nizamuddin Hyder	Hyderabad.
5.	Mr. C. H. Parr	I. A. R. I.
6.	Mr. D. R. Sethi	Bihar.
7.	Mr. H. R. Stewart	Punjab.
8.	Mr. T. G. Rama Aiyar	Mysore.
9.	Mr. Clarke	Bengal.
10.	Mr. K. I. Thadani	Sind.

7. Developmental Research.

1.	Mr. R. G. Allan	Baroda.
2.	Mr. Vishnu Sahay	United Provinces.
3.	Mr. W. J. Jenkins	Bombay.
4.	Mr. Solomon	Orissa.
5.	Mr. C. H. Parr	I. A. R. I.
6.	Mr. E. J. Bruen	Bombay.
7.	Mr. A. D. Mc. Gregor	Bengal.
8.	Sir Datar Singh	Punjab.
9.	Sir Chunilal V. Mehta	Bombay.
10.	Mr. Maclagan Gorrie	Punjab.
11.	Dr. L. K. Hyder	Aligarh University.

8. *Animal Breeding.*

1. Director, Imperial Veterinary Research Institute, Mukteswar.
2. Director of Dairy Research, New Delhi.
3. Mr. C. H. Parr, Imperial Agriculturist, New Delhi.
4. Mr. Z. R. Kothavala, Imperial Dairy Expert, Bangalore.
5. Mr. E. J. Bruen, Livestock Expert, Bombay, Poona.
6. Mr. P. N. Nanda, Superintendent, Government Cattle Farm, Hissar.
7. Mr. T. J. Hurley, Director of Veterinary Services, Madras.
8. Khan Sahib Ali Mohd. Ulvi, Livestock Officer, Sind.
9. Mr. V. L. Wazir, Superintendent, Civil Veterinary Department, Kashmir.
10. Prof. J. N. Warner, Agricultural Research Institute, Allahabad.
11. Sir Datar Singh, Montgomery.

9. *Animal Diseases and Pests Committee.*

1. The Director, Imperial Veterinary Research Institute, Mukteswar.
2. The Director of Dairy Research, New Delhi.
3. The Director of Veterinary Services in India (or representative).
4. Mr. A. D. MacGregor, Veterinary Adviser to the Government of Bengal, Calcutta.
5. Mr. E. S. Farbrother, Director of Veterinary Services, Bombay, Poona.
6. Mr. M. I. Malik, Director of Veterinary Services, Bihar.
7. Rai Bahadur S. K. Sen, Entomologist, Imperial Veterinary Research Institute, Mukteswar.
8. Dr. H. N. Ray, Protozoologist, Imperial Veterinary Research Institute, Mukteswar.
9. Mr. T. J. Egan, Director of Veterinary Services, United Provinces, Lucknow.
10. Captain U. W. F. Walker, Director of Veterinary Services, Punjab.
11. Mr. B. K. Badami, Director of Agriculture, Hyderabad.
12. Dr. M. A. Moghe, Head of the Department of Zoology, College of Science, Nagpur.

10. *Animal Nutrition Committee.*

1. Director, Imperial Veterinary Research Institute, Mukteswar.
2. The Director of Dairy Research, New Delhi.
3. The Public Health Commissioner with the Government of India.
4. Dr. K. C. Sen, Animal Nutrition Section, Izatnagar.
5. Dr. P. E. Lander, Agricultural Chemist, Punjab, Lyallpur.
6. Rao Bahadur B. Viswanath, Director, Imperial Agricultural Research Institute, New Delhi.
7. Mr. J. R. Haddow, Imperial Veterinary Research Institute, Mukteswar.
8. Mr. P. V. Ramiah, Agricultural Chemist, Coimbatore.
9. Mr. I. B. Chatterjee, Animal Nutrition Laboratory, Dacca.
10. Mr. S. D. Achar, Superintendent, Civil Veterinary Department, Mysore.
11. Mr. H. B. Shahi, Director of Veterinary Services, Central Provinces.

B.—Commodity Committees.

1. *Rice.*

1. Mr. C. R. Srinivasa Ayyangar, Madras.
2. Mr. Alam, Bihar.
3. Director of Agriculture, Bengal.
4. Dr. V. K. Badami, Deputy Director of Agriculture, Cuttack.
5. A representative of Dehra Dun Basmati Rice Producers Co-operative Marketing Society, Dehra Dun.

6. Mr. A. Bhattacharyya, Bengal Rice Mills Association.
7. The President, Nellore Rice Grading Union.
8. A representative of the Bombay Rice Merchants' Association.
9. A representative of Messrs. Sant Bros., Lahore.
10. Professor P. J. Thomas, Madras.

2. *Wheat and Barley.*

1. Director of Agriculture, Punjab.
2. Director of Agriculture, Gwalior.
3. Mr. Ramdhan Singh, Cerealist, Punjab.
4. Dr. B. P. Pal.
5. Nawab Jamshed Ali Khan, U. P.
6. Mr. Lyall, Calcutta Flour Mills Association.
7. Mr. Hansraj Gokuldas, Wallace Flour Mills, Bombay.
8. A nominee of the Marwadi Chamber of Commerce, Bombay.
9. A nominee of the Indian Merchants' Association, Karachi.
10. Dr. L. C. Jain, Punjab University.

3. *Pulses and Millets.*

1. Director of Agriculture, Sind.
2. Director of Agriculture, Central Provinces.
3. Director of Agriculture, Baroda.
4. Rao Bahadur G. N. Rangaswami Ayyangar, Millet, Specialist, Madras.
5. Mr. B. S. Kadam, Bombay.
6. Khan Bahadur Abdul Hayat Khan (Bengal).
7. A representative of the Bihariji Oil and Dal Mills, Patna.
8. Sardar Harnam Singh, Bhatinda (Dal) Mills.
9. A nominee of the Grain Merchants' Association, Bombay.
10. A nominee of the Indian Merchants, Association, Karachi.
11. Prof. Gadgil, Gokhale Institute of Political Economy and Political Philosophy, Poona

4. Oilseeds.

1. Director of Agriculture, Bombay.
2. Director of Agriculture, Hyderabad.
3. Mr. T. S. Sabnis, United Provinces.
4. Mr. C. M. John, Oilseeds Specialist, Madras.
5. Mr. Rajeswar Prasad Narayan Sinha, M.L.A., Muzaffarpur, Bihar.
6. Mr. Govindram Seksaria, (Hyderabad) Sind.
   wastik Oil Mills, Bombay.
8. Mr. C. L. Jatia, of Messrs. Mahaliram Ramjidass, Calcutta.
9. Mr. Ratilal M. Gandhi, Bombay.
10. Dr. L. K. Hyder, Aligarh Muslim University.

5. *Tobacco.*

1. Mr. G. Pal, M.Sc., Agricultural Chemist, Dacca.
2. Mr. C. V. S. Chetty.
3. irector of Agriculture, Bihar.
4. Director of Agriculture, Mysore.
5. A representative of producers from Bombay or Baroda to be appointed the Vice-Chairman after consultation with the Director of Agriculture, Bombay, and the Commissioner of Agriculture, Baroda.
6. A representative of the National Tobacco Co. Ltd., Calcutta.
7. A representative of Messrs. Spencer & Co., Ltd., Madras.
8. A representative of the Indian Leaf Tobacco Development Co. Ltd., Calcutta.
9. The Chairman, Markets Committee, Guntur.
10. Dr. Gyan Chand, Patna.

6. *Fruit and Fruit Products.*

1. Sardar Lal Singh, Fruit Specialist to the Government of the Punjab.
2. Mr. S. S. Bhat (Baroda).
3. Dr. P. K. Sen.
4. Director of Agriculture, Madras.
5. Director of Agriculture, N. W. F. P.
6. Director of Agriculture, Kashmir.
7. A representative of the Madras Provincial Co-operative Fruit Marketing Society.
8. Capt. Mitchell, Indian Mildura Farm, Renal Khurd, Punjab.
9. A representative of the Madhu Canning Co., Bombay.
10. Mr. Keshandass Kalidass, Fruit Merchant, Calcutta.
11. A representative of the Fruit Merchants' Association, Subzimandi, Delhi.
12. A representative of the railways nominated by the Railway Board.

7. *Vegetables (including potatoes).*

1. Dr. B. P. Pal.
2. Dr. Swarn Singh.
3. Director of Agriculture, U. P.
4. Director of Agriculture, Assam.
5. A representative of the Nilgiris District Potato and Agricultural Produce Growers Co-operative Sale Society Ltd., Anaikara Street, Mettupalaiyam.
6. Sri Krishna Dutt, Pickle Manufacturers, Calcutta.
7. Chowdhury Mukhtar Singh, Daurala Sugar Works, Meerut.
8. Messrs. Moosa Jooma and Co., Importers and Commission Agents for Potato, Duncan Road, Bombay.
9. Messrs. Krishna Chandar Kalipada Shaha, Commission Agents and Bankers, Aluposta Market, Calcutta.
10. A representative of the railways nominated by the Railway Board.

8. *Miscellansous (including Fibres, Drugs and Species).*

1. Dr. R. H. Richaria, C. P. and Berar.
2. Mr. Yenga Narayan Aiyar.
3. Director of Agriculture, Travancore.
4. Director of Agriculture, Kashmir.
5. Mr. I. Bull, Coorg.
6. A representative of Messrs. McNeil, Rope Works, Calcutta.
7. A representative of Messrs. Bengal Chemical and Pharmaceutical Works.
8. A representative of the Travancore Chamber of Commerce.
9. A representative of the Bihar Chamber of Commerce dealing in species.
10. Col. R. N. Chopra.

9. *Fodder and Grazing.*

1. Mr. R. G. Allan, Baroda.
2. Mr. L. S. S. Kumar, Bombay.
3. Mr. Woodford, Assam.
4. Mr. C. H. Parr, I. A. R. I.
5. Dr. M. Gorrie, Punjab.
6. The Inspector General of Forests.
7. Sir Datar Singh, Punjab.
8. Mr. W. S. Read, Punjab.
9. Dr. K. C. Sen, I. V. R. I.
10. Mr. T. J. Hurley, Director of Veterinary Services, Madras.
11. Dr. V. K. Badami.

10. *Milk and Milk Products.*

1. Dr. W. L. Davies, Director of Dairy Research, New Delhi.
2. Mr. B. N. Banerjee, Indian Institute of Science, Bangalore.
3. Mr. T. J. Hurley, Director of Veterinary Services, Madras.
4. Mr. F. J. Gossip, Livestock Expert, Bengal, Dacca.
5. Mr. E. J. Gruen, Livestock Expert, Bombay, Poona.
6. Lt.-Col. C. E. Mac Guckin, Inspector of Military Dairy Farms, Lahore Cantonment.
7. Sardar Bahadur Sir Datar Singh, Montgomery.
8. Mr. W. Keventer, C/o. Messrs. Edward Keventer Ltd., Aligarh.
9. Mr. K. N. Sivan, Secretary, Madras Co-operative Milk Union Ltd., Madras.
10. A representative of Messrs. Polsons, Bombay.
11. Mr. B. Rakhit of Calcutta, Ghee Merchant.
12. Professor Warner of the Allahabad Agricultural Institute.

The Public Health Commissioner with the Government of India will be a member of this committee.

11. *Wool.*

1. Capt. W. S. Read, R.I.A.S.C., Napier Hotel, Lahore Cantonment.
2. Dr. K. Venkataraman, Department of Chemical Technology, Bombay University, Bombay.
3. Mr. S. N. Sarwar, Superintendent, Civil Veterinary Department, North West Frontier Province, Peshawar.
4. Mr. E. J. Bruen, Livestock Expert, Bombay, Poona.
5. Mr. R. W. Littlewood, Livestock Development Officer, Madras, Hosur.
6. Mr. C. H. Tattersall, Inspector of Stores, Cawnpore.
7. The President, Wool Merchants' Association, Fazilka.
8. Mr. W. W. D. Scott, Bangalore Cotton Silk and Woollen Mills Ltd., Bangalore.
9. A representative of Messrs. Ralli Brothers (Wool Expert Branch), Karachi.
10. Mr. Shamji Mal, Wool Merchant, Amritsar.
11. Mr. Rajeshwar Nath, Raj Woollen Textiles, Panipat.
12. A representative of the Rajputana States selected by the Vice Chairman. (Mr. A. K. Wattal may be considered in this connection).

12. *Poultry and Eggs.*

1. Mr. A. J. Macdonald, Officer in Charge, Poultry Research Section, Imperial Veterinary Research Institute, Izatnagar.
2. A Poultry Expert nominated by the Vice-Chairman.
3. Mr. T. J. Egan, Director of Veterinary Services, United Provinces, Lucknow.
4. Mr. A. E. Slater, Mission Poultry Farm, Etah.
5. Mr. J. Williams, 3, Sholapur Road, Poona.
6. Mr. S. A. Imam, Orange Poultry Farm, Madanpur (P. O.) Alinagar, Gaya District.
7. Mr. Ansar Ali, Egg Merchant, 10, Corporation Place, Calcutta.
8. A representative of the Frontier Co-operative Egg Grading Society and Sale Association Ltd., Peshawar.
9. Dr. Spencer Hatch, Y. M. C. A., Martandam (Travancore).
10. M. M. Ibrahim Brothers, Egg Exporters, 22, Varadaraja Mudaliar Street, George Town, Madras.

13. *Livestock.*

1. Mr. Z. R. Kothavalla, Imperial Dairy Expert, Bangalore.
2. Mr. C. H. Parr, Imperial Agriculturist, Imperial Agricultural Research Institute, New Delhi.
3. Capt. U. W. F. Walker, Director of Veterinary Services, Lahore.
4. Mr. R. C. Woodford, Deputy Director of Agriculture, (Livestock), Assam, Shillong.
5. Mr. Mundhe, Animal Husbandry Officer, Baroda.
6. Sardar Bahadur Sir Datar Singh, Montgomery.
7. Malik Faizullah Khan, Secretary, District Board, Lyallpur.
8. Sir Chunilal V. Mehta, Bombay.
9. Mr. Nariman R. Kothawalla, Ellis Bridge, Ahmedabad.
10. A representative of the Calcutta Pinjrapole Society, Calcutta.

14. *Fish.*

1. Rai Bahadur Dr. S. L. Hora, D. Sc., Assistant Superintendent, Zoological Survey of India, Indian Museum, Calcutta.
2. Dr. S. B. Sethna, Fisheries Development Officer, Bombay.
3. Mr. S. T. Moses, Director of Fisheries, Baroda.
4. Dr. Hamid Khan Bhatti, Fisheries Research Officer, Lyallpur.
5. Dr. B. Sundar Raj, Madras.
6. Dr. H. R. Mehra, Reader, Department of Zoology, Allahabad University, Allahabad.
7. A representative of the fish trade to be nominated by the Director of Agriculture, Orissa.
8. Mr. Krishnaswami Naidu, Proprietor, the Malabar Fisheries Co., Chaliyam (S. Malabar).
9. A representative of Messrs. Parry & Co., Ltd., Fish Manure Merchants, Madras.
10. Mr. S. R. Kaka, Fish Contractor, Bombay.
11. A representative of the Fish Cold Storage Department, Spencer and Co., Ltd., Delhi.
12. One non-official representative from Sind, nominated by the Vice-Chairman.

15. *Hides and Skins Committee.*

1. Rai Bahadur S. K. Sen, Entomologist, Imperial Veterinary Research Institute, Mukteswar.
2. Rai Bahadur B. M. Dass, Superintendent, Bengal Tanning Institute, Calcutta.
3. Mr. L. B. Green, Director of Industries, Madras.
4. Khan Sahib Ghulam Hussain, Animal Husbandry Officer, Bhopal.
5. Mr. A. D. MacGregor, F.R.C.V.S., Veterinary Adviser to the Government of Bengal.
6. Mr. P. F. G. Hepburn, Assistant Works Manager, Harness and Saddlery Factory, Cawnpore.
7. Mr. M. Sadik. Hide and Skin Merchant, Exporter, Delhi.
8. A representative of Tanners' Federation of India, Cawnpore.
9. A representative of the Karachi Hides and Skins Shippers Association, Karachi.
10. Mr. Mohd. Latif, Chairman, Cawnpore Hide Merchants Association, Cawnpore.

APPENDIX VI.

Annual Accounts for the year 1940-41 relating to the grant for research purposes.

Receipts.		Payments.					
Heads of Accounts.	Receipts during the year.	Grants.		Heads of Accounts.	Expenditure during the year.	Excess — or Savings + over net grant.	Remarks.
		Original.	Net.				
1	2	3	4	5	6	7	8
	Rs. a. p.	Rs.	Rs.		Rs. a. p.	Rs. a. p.	
1. Opening balance on 1st April 1940.	1,19, 656 12 11	500	500	1. U. P. Sugarcane Seedling Scheme	505 0 0	—5 0 0	Inconsiderable.
2. Receipts under the Agricultural Produce Cess Act.	8, 28, 274 0 0	41,700	35,000	2. Sugarcane Research Station in the Bombay—Deccan.	34,934 10 0	+65 6 0	,,
3. Grants from the Central Government for research work—		30,500	30,000	3. Establishment of sugarcane station in Bihar and apptt. of a sugarcane specialist.	30,011 4 0	—11 4 0	,,
(i) Grant for Marketing Scheme.	1,80,000 0 0	11,900	7,200	4. Establishment of a sub-station of the Coimbatore Imperial Sugar Station at Karnal.	7,130 0 0	+70 0 0	,,
(ii) Special grant for research work from the Sugar Excise Fund.	3,00,000 0 0	22,200	18,000	5. Research on the diseases of sugarcane.	17,914 4 6	+85 11 6	,,
4. Grants from Indian States—		2,300	2,300	6. Sugarcane Seedling Testing Station at Dacca.	2,280 0 0	+20 0 0	,,
(i) Baroda . .	5,000 0 0	6,600	6,700	7. Scheme for breeding thickcanes in Mysore.	6,700 0 0	..	,,

(ii) Cochin	10,000	0	0	5,100	3,200	8. Research on the genetics of sugarcane at the Imperial Cane-breeding Station, Coimbatore.	3,123	0	0	+ 77	0	0	"
(iii) Travancore	10,000	0	0	19,800	7,800	9. Research on sugarcane in the Madras Presidency.	7,754	10	0	+ 45	6	0	"
(iv) Bhopal	2,500	0	0										
(v) Kashmir	5,000	0	0	26,300	26,300	10. Scheme for the establishment of a Sugarcane research station for the Punjab.	26,300	0	0	..			"
(vi) Gwalior	20,000	0	0										
5. Interest from Investments—				22,900	20,000	11. Investigation into various problems of Sugar Industry in the U. P.	19,950	0	0	+ 50	0	0	"
(i) Interest from 2¾ per cent. loan 1948-52.	10,972	8	0	25,600	21,400	12. Establishment of a Research and Testing Station for the indigenous system of gur and sugar manufacture, Bilari.	21,360	15	9	+ 39	0	3	"
(ii) Interest from 3½ per cent. loan 1947-50.	19,201	12	0	3,200	*Nil*	13. Extension of sugarcane work at the Jorhat Experimental Station, Assam.	*Nil*			..			"
(iii) Interest from 3 per cent. loan 1963-65.	49,361	4	0	6,000	*Nil*	14. Bureau of sugar standard	*Nil*			..			"
				800	800	15. Research on the structural anatomy of sugarcane.	750	0	0	+ 50	0	0	"
(iv) Interest from fixed deposits, from Motor Car advance.	1,175	3	0	14,300	14,300	16. N. W. F. P. sugarcane scheme	14,300	0	0	..			"
				1,500	3,400	17. Research on the chemistry of sugarcane.	3,371	10	0	+ 28	6	0	"
(v) Interest from 3 per cent. Defence Bonds, 1946.	311	8	0	2,300	2,220	18. Investigation of suitable types of cane for Gujrat.	2,160	0	0	+ 40	0	0	"
Carried over						Carried over							

Receipts.			Payments.					
Heads of Accounts.	Receipts during the year.	Grants.		Heads of Accounts.	Expenditure during the year.	Excess — or Savings + over net grant.	Remarks.
		Original.	Net.				
1	2	3	4	5	6	7	8
Brought forward .	Rs. a. p.	Rs.	Rs.	Brought forward.	Rs. a. p.	Rs. a. p.	
6. Miscellaneous Receipts—		4,000	900	19. Scheme for the utilisation of bagasse for the paper and board industry.	906 11 6	—6 11 6	Inconsiderable.
(i) Receipts from the I. C. C. C. on account of moiety of expenditure payable for the scheme of investigation into the cost of production of crops in the principal Sugarcane and cotton tracts of India.	854 10 0	6,300	2,200	20. Scheme regarding the manufacture of cattle feed from molasses.	2,200 0 0	..	„
				21. Planning of experiments on ratooning of sugarcane—			
		5,400	5,000	(a) United Provinces . .	5,013 4 0	—13 4 0	„
		5,200	5,200	(b) Bihar	5,200 0 0	..	„
(ii) Receipts realised by the various provincial Governments from schemes financed from the funds of the Council.	37,835 13 7	42,300	33,200	22. Central sugarcane Insect Pests Scheme.	33,818 6 0	—618 6 0	„
				23. Research on the insects pests of sugarcane—			
		4,000	5,200	(a) Bombay	5,160 0 0	+40 0 0	„
(iii) Receipts from unspent balances of grants made by the Council.	4,740 6 4	11,600	8,100	(b) Bihar	8,100 0 0	..	„
		12,200	12,400	(c) United Provinces . .	12,383 4 0	+16 12 0	„
		6,000	*Nil*	(d) Orissa	*Nil*	..	„

(iv) Other Miscellaneous Receipts.	*11,042 3 11*	*Nil*	*Nil*	*(e) Mysore*	*Nil*	..	
7. Debts and Remittances—		6,000	8,300	*(f)* Bengal	8,240 0 0	+60 0 0	,,
(i) Refund of loans and advances to Council servants.	420 0 0	*Nil*	*Nil*	*(g)* Hyderabad	*Nil*	..	,,
		6,000	3,400	*(h)* Madras	3,400 0 0	..	,,
(ii) Deposits and advances.	1,238 4 0	6,000	5,000	*(i)* Punjab	4,960 0 0	+40 0 0	,,
(iii) Recoveries from Research staff on account of Income-tax, Provident Fund, etc.	1,712 1 0	10,000	*Nil*	*(j)* Indian Statistical Institute	*Nil*	..	
		7,400	7,100	24. Sugar Marketing Survey	7,031 0 0	+69 0 0	,,
		5,900	5,800	25. Research on reclamation of alkaline and Usar lands in the United Provinces with molasses.	5,800 0 0	..	,,
Total Receipts	16,19,296 6 9		3,000	26. Sugar Committee	2,954 9 0	+45 7 0	
Receipts on account of repayments of investments and re-investments.	7,00,000 0 0	3,000	*Nil*	27. Appointment of the Chief Economist and staff in connection with the investigation into the cost of production of crops in the principal sugarcane and cotton tracts in India.	21 5 0	—21 5 0	,, ,,
GRAND TOTAL	23,19,296 6 9						
		Nil	500	28. Grading of Gur and Bura	470 0 0	+30 0 0	
		14,000	9,100	29. Survey of the yield and gur cane ratio.	9,100 0 0	..	,, ,, ,,
		9,400	6,000	30. Manufacture of Sugar Candy	6,000 0 0	..	
			Nil	31. Grant to the Government of the Punjab for locust control measures.	*Nil*	..	,, ,,
		.. 17,000	13,900	32. Special staff for research work on locust control.	13,948 11 9	—48 11 9	
				Carried over.			,,

Receipts.		Payments.					
Heads of Accounts.	Receipts during the year.	Grants.		Heads of Accounts.	Expenditure during the year.	Excess — or Savings + over net grant.	Remarks.
		Original.	Net.				
1	2	3	4	5	6	7	8
	Rs. a. p.	Rs.	Rs.		Rs. a. p.	Rs. a. p.	
				Brought forward			
		1,000	*Nil*	33. Locust committee . .	*Nil*	..	Inconsiderable.
		14,000	24,600	34. Botanical sub-station, Pusa .	24,550 7 7	+49 8 5	,,
		8,800	16,100	35. Investigation of rusts of wheat and barley, Agra.	16,085 0 0	+15 0 0	,,
		14,600	14,100	36. Research on agricultural meteorology, Poona.	14,018 3 6	+81 12 6	,,
		2,100	4,000	37. Appointment of a physical assistant to the staff of the Agricultural Chemist, Bengal.	3,975 0 0	+25 0 0	,,
				38. Co-ordinated schemes of rice research—			
		6,200	8,900	(*a*) Bengal	8,850 0 0	+50 0 0	,,
		10,200	7,400	(*b*) U. P.	7,400 0 0	..	,,
		8,500	14,300	(*c*) Bihar	14,300 0 0	..	,,
		6,000	5,700	(*d*) C. P.	5,650 0 0	+50 0 0	,,
		5,400	1,500	(*e*) Assam	1,496 6 0	+4 10 0	,,
		14,100	22,300	(*f*) Orissa	22,271 3 3	+28 12 9	,,

				39. Malting and brewing tests of improved barleys—						
		2,100	2,100	(a) U. P.	2,040	0	0	+60	0	0	„
		Nil	*Nil*	(b) Punjab	*Nil*			..			„
		1,700	2,000	40. San jose Scale Survey in the Punjab to prevent the pest spreading to other parts of the Punjab, U. P. and N. W. F. P.	1,980	0	0	+20	0	0	„
		6,700	9,000	41. Research in systematic cultivation of medicinal plants and study of food poisons.	8,973	4	9	+26	11	3	„
				42. Dryfarming research in—							
		16,100	15,300	(a) Ceded districts of Madras .	15,240	15	0	+59	1	0	„
		32,900	22,700	(b) Bombay-Deccan . .	28,670	0	0	+30	0	0	„
		21,100	16,700	(c) Punjab	16,700	0	0	..			„
		8,500	7,000	(d) Hyderabad-Deccan . .	7,000	0	0	..			„
		8,700	7,300	43. Scheme for the improvement of the Castor Crop in India.	7,300	0	0	..			„
		8,800	21,500	44. Potato breeding research, Northern India.	21,440	0	0	+60	0	0	„
		19,800	17,500	45. Bombay scheme of cold storage of fruits.	17,490	15	9	+9	0	3	„
				46. Provincial schemes of fruit research—							
		8,800	9,100	(a) Madras	9,033	14	3	+66	1	9	„
				Carried over . .							

Receipts.		Payments.					
Heads of Accounts.	Receipts during the year.	Grants. Original.	Grants. Net.	Heads of Accounts.	Expenditure during the year.	Excess — or Savings + over net grant.	Remarks.
1	2	3	4	5	6	7	8
	Rs. a. p.	Rs.	Rs.	Brought forward .	Rs. a. p.	Rs. a. p.	
				46. Provincial schemes of fruit research—*contd.*			
		2,300	4,600	(*b*) Bengal	4,590 0 0	+10 0 0	Inconsiderable.
		23,800	15,900	(*c*) U. P.	15,900 0 0	..	,,
		10,000	10,100	(*d*) Punjab-Citrus and Grape Vines.	10,100 0 0	..	,,
		10,300	10,300	(*e*) Bihar	10,300 0 0	..	,,
		13,500	300	(*f*) C. P.	260 0 0	+40 0 0	,,
		5,200	5,100	(*g*) N. W. F. P. . . .	5,070 0 0	+30 0 0	,,
		7,000	*Nil*	(*h*) Assam	*Nil*	..	,,
		4,700	3,800	(*i*) Orissa	3,800 0 0	..	,,
		3,800	*Nil*	(*j*) Hyderabad . . .	*Nil*	..	,,
		9,300	7,200	(*k*) Mysore	7,211 12 7	—11 12 7	,,
		5,400	4,800	(*l*) Punjab—Fruit and vegetable preservation.	4,770 0 0	+30 0 0	,,
		800	600	47. Bengal flax fibres research scheme.	600 0 0	..	,,

	16,200	15,500	48. Research on tobacco at Guntur sub-station.	15,490	11	0	+9	5	6	"
	12,500	16,100	49. Research on the virus diseases of plants, Bombay.	16,097	0	0	+3	0	0	"
			50. Oilseed research schemes—							
	9,100	7,500	(*a*) Groundnut, Madras . .	7,620	0	0	—20	0	0	"
	3,600	3,600	(*b*) Linseed, Bengal . . .	3,600	0	0	..			"
	6,600	6,900	(*c*) Rape and Mustard, Punjab .	6,870	0	0	+30	0	0	"
	10,300	9,900	(*d*) Linseed, C. P. . . .	9,900	0	0	..			"
	11,500	11,300	51. Research on the diseases of coconut palm in South India.	11,300	0	0	..			"
	8,400	8,000	52. Scheme *re* the establishment of a fruit canning and preserving laboratory at Quetta.	8,000	0	0	..			"
			53. Investigation on Sunn-hemp—							
	200	400	(*a*) Madras	400	0	0	..			"
	Nil	100	(*b*) Bombay	125	9	3	—25	9	3	"
	200	*Nil*	(*c*) Bihar	*Nil*			..			"
	2,100	1,900	(*d*) C. P.	1,869	14	0	+30	2	0	"
	5,500	*Nil*	54. Scheme for the supply of decorticated cotton seed cake for propaganda.	*Nil*			..			"
	17,400	10,400	55. Research on water requirements of crops in the Punjab.	10,400	0	0	..			"
			Carried over .							

Receipts.		Payments.											
Heads of Accounts.	Receipts during the year.	Grants.		Heads of Accounts.	Expenditure during the year.			Excess — or Savings + over net grant.			Remarks.
		Original.	Net.								
1	2	3	4	5	6			7			8
	Rs. a. p.	Rs.	Rs.		Rs.	a.	p.	Rs.	a.	p.	Inconsiderable.
				Brought forward							
		3,200	4,000	56. Investigation into the attack on Jowar by the Parasite Striga.	4,006	8	0	—6	8	0	„
		8,600	7,300	57. Research on coconuts in the Madras Presidency.	7,240	0	0	+60	0	0	„
		6,300	6,100	58. Research on wheat breeding at Simla sub-station.	6,076	0	0	+24	0	0	„
		2,41,800	1,97,400	59. Provincial Marketing schemes.	1,97,365	15	3	+34	0	9	„
		8,500	8,900	60. Dacca University scheme of agricultural research—							
				(a) Lateritic Soils . . .	8,879	10	0	+20	6	0	„
				(b) Nutrition of rice plant . .							
		10,200	10,200	61. Research into the properties of colloid soil constituents.	10,220	0	0	—20	0	0	„
		13,700	13,700	62. Investigation of experimental errors in field trials.	13,729	4	0	—29	4	0	„
		1,200	1,300	63. Investigation of the organic constituents of Indian soils.	1,285	0	0	+15	0	0	„

		3,500	3,800	64. Investigation for preparation of cheap synthetic manure from town refuse and waste materials.	3,800	0	0	..		"
		4,700	4,700	65. Research on plant physiology by Dr. Boshi Sen.	4,700	0	0	..		"
		11,800	6,400	66. Research on plant physiology at the Benares Hindu University.	6,413	8	0	—13	8	0 "
		3,400	2,500	67. Bombay rust research scheme	2,533	0	0	—33	0	0 "
		5,400	5,400	68. Research on San Jose Scale and Woolly Aphis in Kashmir.	5,400	0	0	..		"
		5,700	*Nil*	69. Research on the cultivation of 'pan' in the C. P.	*Nil*			..		"
		2,500	*Nil*	70. Bhopal Kans Eradication scheme.	*Nil*			..		"
		4,700	4,700	71. Research into problems of coastal soils.	4,700	0	0	..		"
		3,000	*Nil*	72. Mysore Coffee research scheme	*Nil*			..		"
		15,500	7,900	73. Scheme *re.* the training of officers in the tobacco cultivation and research.	7,883	15	6	+16	0	6 "
		16,000	14,400	74. Statistical section	14,398	7	6	+1	8	6 "
		5,000	3,100	75. Baroda Paddy Research	3,060	0	0	+40	0	0 "
		3,800	1,600	76. Travancore Rice Research	1,600	0	0	..		"
		35,000	24,600	77. Development of research at I. A. R. I. on lines suggested by Sir John Russel.	24,590	0	0	+10	0	0 "
				Carried over	..					

Receipts.		Payments.					
Heads of Accounts.	Receipts during the year.	Grants. Original.	Grants. Net.	Heads of Accounts.	Expenditure during the year.	Excess — or Savings+ over net grant.	Remarks.
1	2	3	4	5	6	7	8
	Rs. a. p.	Rs.	Rs.		Rs. a. p.	Rs. a. p.	
				Brought forward			
		5,700	3,000	78. Preparation of Critical Monograph on Dry Farming . .	2,983 0 0	+17 0 0	Inconsiderable.
		2,700	2,400	79. Research on the cytology of papaya, Bombay.	2,380 0 0	+20 0 0	„
		2,800	*Nil*	80. Rice Research in Kashmir .	*Nil*	..	„
		3,300	*Nil*	81. Pedological study of black cotton and other soils.	*Nil*	..	„
		3,500	*Nil*	82. C. P. Wheat breeding scheme	*Nil*	..	„
		7,000	*Nil*	83. Sind subsurface Investigation scheme.	*Nil*	..	„
		2,000	1,000	84. Scheme for the preparation of tables for the studentized form of D_2 statistics.	1,000 0 0	..	„
		Nil	4,000	85. Cardamoms Survey Scheme .	4,000 0 0	..	„
		5,100	5,500	86. Dr. Slater's scheme of goat breeding in U. P.	5,450 0 0	+50 0 0	„
		16,100	15,200	87. Bengal Animal Nutrition scheme.	15,170 0 0	+30 0 0	„

				88. Appointment of Vety. Investigation Officer—			
	7,700	7,700		(a) Madras	7,650 0 0	+50 0 0	,,
	9,100	4,900		(b) Bombay	4,891 12 0	+8 4 0	,,
	8,500	6,900		(c) Bengal	6,900 0 0	..	,,
	8,800	9,000		(d) United Provinces . .	9,000 0 0	..	,,
	7,800	6,500		(e) Punjab	6,500 0 0	..	,,
	6,600	6,600		(f) Bihar	6,600 0 0	..	,,
	9,600	7,000		(g) Central Provinces . .	7,000 0 0	..	,,
	6,800	5,000		(h) Assam	4,950 0 0	+50 0 0	,,
	9,600	8,900		(i) Hyderabad Deccan . .	8,900 0 0	..	,,
	7,400	6,800		(j) North-West Frontier Province	6,745 0 0	+55 0 0	,,
	8,800	8,100		(k) Sind and Ajmer-Merwara .	8,100 0 0	..	,,
	6,900	*Nil*		(l) Orissa	*Nil*	..	,,
		Nil		89. Research on the composition of milk at the Allahabad Agricultural Institute.	4 10 0	—4 10 0	,,
	3,100	4,400		90. Investigation of Johne's disease among cattle in Mysore.	4,335 0 0	+65 0 0	,,
	9,900	9,000		91. Madras Animal Nutrition Scheme.	8,960 0 0	+40 0 0	,,
	6,900	*Nil*		92. Research on warble flies .	*Nil*	..	,,
	4,000	4,000		93. Investigation of indigenous sheepbreeding in the Punjab.	3,910 0 0	+90 0 0	,,
				Carried over .			

Receipts.		Payments.					
Heads of Accounts.	Receipts during the year.	Grants. Original.	Grants. net.	Heads of Accounts.	Expenditure during the year.	Excess — or Savings + over net grant.	Remarks.
1	2	3	4	5	6	7	8
	Rs. a. p.	Rs.	Rs.	Brought forward . .	Rs. a. p.	Rs. a. p.	
		17,900	*Nil*	94. Research on the feeding of cattle on departmental farms, U. P.	*Nil*	..	Inconsiderable.
		7,000	7,100	95. Scheme of research in poultry husbandry in the Bombay Presidency.	7,103 7 8	—3 7 8	„
		5,400	4,500	96. Scheme of research on the analysis of foodstuffs for cattle.	4,440 0 0	+60 0 0	„
		1,900	2,600	97. Research on fresh water fishes in Bengal.	2,608 0 0	—8 0 0	„
		2,100	2,100	98. Scheme for the improvement of poultry for table purposes, Punjab.	2,160 0 0	—60 0 0	„
		7,600	11,600	99. Bombay sheepbreeding scheme	11,571 6 0	+28 10 0	„
		13,100	*Nil*	100. Investigation of tuberculosis and Johne's disease among cattle at I. V. R. I.	*Nil*	..	„
		25,000	*Nil*	101. Investigation into contagious abortion in cattle, sheep and goats at I. V. R. I.	*Nil*	..	„

		7,200	*Nil*	102. Research into the diseases of poultry.	*Nil*			..			,,
		5,200	4,400	103. Enquiry into the helminthiasis of cattle, sheep and goats in the U. P.	4,401	6	0	—1	6	0	,,
		8,700	500	104. Scheme *re.* the appointment of a protozoologist at the I. V. R. I.	459	0	0	+41	0	0	,,
		Nil	*Nil*	105. Research in the manufacture of products and byeproducts of milk at the Anand Creamery.	*Nil*			..			,,
		7,200	*Nil*	106. Scheme for determining the feeding values of certain food grains, oilseeds and cakes for working bullocks and dairy cattle.	*Nil*			..			,,
		2,700	*Nil*	107. Punjab indigenous goat breeding scheme.	*Nil*			..			,,
		14,000	9,900	108. Madras scheme regarding the toxicology of Indian drugs.	9,900	0	0	..			,,
		13,100	13,100	109. Grant to the Punjab Government for sending an officer of the Punjab Veterinary service, class I, on deputation to South Africa to study the Angora goat industry.	13,000	0	0	+100	0	0	,,
		3,000	3,000	110. Madras sheep breeding scheme	2,948	1	3	+51	14	9	,,
		11,200	*Nil*	111. Scheme for testing the value of different methods of controlling or eradicating ticks, Bombay.	*Nil*			..			,,
		1,500	1,500	112 Grant to the Allahabad Agricultural Institute for the I. D. D. course.	1,500	0	0	..			,,
				Carried over				..			

Receipts.		Payments.					
Heads of Accounts.	Receipts during the year.	Grants. Original.	Grants. Net.	Heads of Accounts.	Expenditure during the year.	Excess — or Savings + over net grant.	Remarks.
1	2	3	4	5	6	7	8
	Rs. a. p.	Rs.	Rs.	Brought forward .	Rs. a. p.	Rs. a. p.	
		2,400	1,200	113. Madras Helminthiasis scheme.	1,170 0 0	+30 0 0	Inconsiderable.
		15,000	*Nil*	114. Assam Animal Nutrition Scheme.	*Nil*	..	,,
				115. Scheme *re.* the formation of milk recording societies—			
		1,100	300	(*a*) Madras	255 4 6	+44 11 6	,,
		500	400	(*b*) Bombay	400 0 0	..	,,
		500	600	(*c*) U. P.	600 0 0	..	,,
		1,400	1,300	(*d*) Punjab	1,270 0 0	+30 0 0	,,
				116. Scheme for defining breed characteristics of cattle—			
		Nil	*Nil*	(*a*) Bombay	*Nil*	..	,,
		1,000	1,000	(*b*) Punjab	999 10 0	+0 6 0	,,
		Nil	100	117. Scheme *re.* the study of indigenous veterinary methods.	56 11 0	+43 5 0	,,

		11,000	11,000	118. All India Animal Husbandry Bureau.	10,910	13	0	+ 89	3	0	"
		4,000	2,900	119. Animal Genetics scholarship scheme.	2,862	11	7	+ 37	4	5	"
		3,800	2,700	120. Bombay Wool Analysis Scheme.	2,700	0	0	..			"
		8,200	3,100	121. Scheme for the survey of helminth infection in India.	3,050	0	0	+ 50	0	0	"
		1,800	1,400	122. Mysore sheep breeding scheme	1,408	0	0	—8	0	0	"
		2,100	1,100	123. C. P. Helminthiasis Scheme .	1,085	0	0	+ 15	0	0	"
				124. Diseases of Poultry—							
		1,600	750	(a) Madras	750	0	0	..			"
		2,450	350	(b) Bombay	350	0	0	..			"
		1,600	1,000	(c) Bihar.	1,000	0	0	..			"
		1,600	1,200	(d) N. W. F. P. . . .	1,190	0	0	+ 10	0	0	"
		3,700	*Nil*	(e) Mysore	*Nil*			..			"
		1,600	*Nil*	(f) U. P.	*Nil*			..			"
		Nil	500	125. Establishment of Wool analysis Laboratory at Poona.	500	0	0	..			"
		3,000	*Nil*	126. Kashmir sheep breeding scheme.	*Nil*			..			"
		1,300	*Nil*	127. Mechanical Flaying of hides	*Nil*			..			"
				Carried over .							

Receipts.		Payments.					
Heads of Accounts.	Receipts during the year.	Grants. Original.	Grants. net.	Heads of Accounts.	Expenditure during the year.	Excess — or Savings + over net grant.	Remarks.
1	2	3	4	5	6	7	8
	Rs. a. p.	Rs.	Rs.		Rs. a. p.	Rs. a. p.	
				Brought forward			
		3,600	*Nil*	128. Maintenance of herd books and registration of milk recording of cattle.	*Nil*	..	Inconsiderable.
		Nil	100	129. Deputation to the International Congress on genetics, Edinburgh and International Congress on Animal Breeding, Zurich.	65 8 0	+34 8 0	,,
		29,000	17,200	130. Contribution to the International Institute of Agriculture, Rome.	17,155 15 0	+54 0 11	,,
		11,400	5,200	131. Contribution to the International office of Epizootics.	5,208 0 0	—8 0 0	,,
		55,700	27,800	132. Contribution to the Imperial Agriculture Bureaux, London.	27,625 0 0	—25 0 0	,,
		4,800	2,400	133. Contribution to the Imperial Bureau of Dairy Science.	2,362 8 0	+37 8 0	,,

		22,800	10,400	*134. Contribution* to Imperial Institute of Mycology, London, Imperial Institute of Entomology, London, and Farnham House Laboratory.	10,426	10	8	—26	10	8	,,
		700	*Nil*	135. Contribution to Fruit and Vegetable Preservation Station, Campden.	*Nil*			..			,,
		500	500	136. Contribution to Indian Academy of Science, Bangalore.	500	0	0	..			,,
		500	500	137. Contribution to National Institute of Science, Calcutta.	500	0	0	..			,,
		750	750	138. Contribution to Indian Society of Soil Science.	750	0	0	..			,,
		7,000	7,200	139. Books and Publications .	7,220	7	0	—20	7	0	,,
		1,000	600	140. Editorial Committee and preparation of abstracts for publications in Council's journals.	604	8	0	—4	8	0	,,
		9,000	9,700	141. Accounts and Audit . .	9,683	11	0	+16	5	0	,,
		7,000	8,500	142. Scheme for the development of refrigerated rail transport.	8,515	1	9	—15	1	9	,,
		7,900	13,800	143. Appointment of Assistant Editor for the Council's journals.	13,760	12	0	+39	4	0	,,
		9,000	8,500	144. T. A. of non-official members of the Council.	8,482	7	0	+17	9	0	,,
		6,000	15,600	145. T. A. of visitors . . .	15,610	2	0	—10	2	0	,,
		300	*Nil*	146. Award of medals for improvements in agriculture and A. H.	*Nil*			..			,,

Receipts.		Payments.					
Heads of Accounts.	Receipts during the year.	Grants. Original.	Grants. Net.	Heads of Accounts.	Expenditure during the year.	Excess — or Savings + over net grant.	Remarks.
1	2	3	4	5	6	7	8
	Rs. a. p.	Rs.	Rs.		Rs. a. p.	Rs. a. p.	
		1,400	900	147. Punjab Cold Storage scheme	890 0 0	+ 10 0 0	Inconsiderable.
		2,000	900	148. Miscellaneous . . .	897 8 0	+ 2 8 0	,,
		1,500	1,100	149. Deposits and advances repayable.	1,057 3 0	+ 42 13 0	,,
		1,500	2,300	150. Remittances of income-tax, provident funds, etc.	2,244 8 0	+ 55 8 0	,,
				Total Expenditure .	14,13,591 6 9		
				Investment and Reinvestment in fixed deposits, etc.	8,80,117 3 0		
				By balance .	25,587 13 0		
				Grand Total .	23,19,296 6 9		

II.—*Particulars of Advances outstanding at the end of the year :—*

Particulars.	Amount. Rs. a. p.
Permanent advance with Secretary, I. C. A. R. . . .	250 0 0
Total . .	250 0 0

III.—*Particulars of Securities, etc. :—*

	Face value.	Purchase Value.	Approximate market value on 31st March 1941.
	Rs.	Rs. a. p.	
1. Three per cent stock 1963-65 (Kept with the Reserve Bank of India, Calcutta).	16,49,500	15,54,334 0 0	Rs. 15,67,025 (at Rs. 95-0-0 for Rs. 100).
2. 3½ per cent stock, 1947-50 (Kept with the Reserve Bank of India, Calcutta).	5,50,000	5,91,495 1 0	Rs. 5,63,406-4-0 (at Rs. 102-7-0 for Rs. 100.)
3. 2¾ per cent stock, 1948-52 (Kept with the Reserve Bank of India, Calcutta).	4,00,000	4,02,736 9 0	Rs. 3,88,000 (at Rs. 97-0-0 for Rs. 100).
4. Ten five-year post office cash certificates, dated the 25th September, 1935 (Renewed).	10,000	8,625 0 0	
5. Six Fixed deposit receipts Nos. B05594 to B05599, dated the 23rd January 1940 bearing interest at ½ per cent and repayable at a week's notice for Rs. 50,000 each.	3,00,000	3,00,000 0 0	
6. Four fixed deposit receipts Nos. A79743 to A79746, dated the 29th August 1940 bearing interest at ½ per cent and repayable at a week's notice for Rs. 50,000 each.	2,00,000	2,00,000 0 0	
7. 3 per cent stock, Defence Bonds, 1946. (Kept with the Reserve Bank of India, Calcutta)	25,000	25,117 3 0	Rs. 25,359-6-0 (at Rs. 101-7-0 for Rs. 100.)
8. Five ten-year post office Defence Savings Certificates, dated the 22nd October, 1940.	5,000	5,000 0 0	

ROYAL ASIATIC SOCIETY. LIBRARY OF THE BOMBAY BRANCH OF THE

IV.—*Particulars of closing balance.*—

	Rs.	a.	p.
Cash in current account with the Imperial Bank of India, Simla	1,927	7	3
Cash in current account with the Imperial Bank of India, New Delhi	23,660	5	9
Total	25,587	13	0

Sd. S. C. SARKAR,

for Secretary,

Imperial Council of Agricultural Research.

The accounts have been examined and according to the best of my information and in consideration of the explanations given as a result of the test audit of the books of the I. C. A. R. the accounts are correct subject to the remarks made in my report of May 1941.

Sd. S. K. BANERJI,

Examiner, C. A. D.

The 1st July 1941.

APPENDIX VII.

Statement showing expenditure incurred up to end of 1940-41 on the various research schemes in progress during the year.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
	I.—AGRICULTURE.				
	A.—Rice.		Rs.	Rs.	Rs.
1	Rice breeding and agronomy—				
	(*i*) Bengal . . .	31-3-41*	1,88,160	1,85,438	2,720
	(*ii*) United Provinces .	31-3-42	2,02,360	1,82,079	20,280
	(*iii*) Bihar . . .	31-3-41*	2,61,020	2,59,603	1,420
	(*iv*) Central Provinces .	31-3-41*	1,22,200	1,19,496	2,700
	(*v*) Assam . . .	31-3-41*	1,29,880	1,21,457	8,420
	(*vi*) Orissa . . .	31-3-41*	82,500	78,330	4,170
2	Special rice schemes—				
	(*i*) Baroda . . .	Nov. 43	13,800	3,060	10,740
	(*ii*) Kashmir . .	31-1-44	9,100	..	9,100
	(*iii*) Travancore . .	Oct. 43	14,600	1,600	13,000
3	Nutrition of rice plant, Dacca	31-3-42	7,350	3,092	4,260
			10,30,970	9,54,155	76,810
	B.—Wheat and Barley.				
4	Rusts of wheat and barley, Agra . . .	30-9-41*	2,69,840	2,61,011	8,830
5	Rust Research, Bombay .	30-9-43	33,660	12,933	20,720
6	Breeding rust resistant wheat, I. A. R. I. . .	31-3-41*	22,050	20,432	1,620
7	Wheat breeding, Central Provinces . . .	Feb. 44	12,620	..	12,620
8	Testing malting qualities of barley, U. P. . .	..	14,350	10,550	3,800
			3,52,520	3,04,926	47,590

*Since extended.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
			Rs.	Rs.	Rs.
	C.—Millets and Pulses.				
9	Striga attack on Jowar, Bombay . . .	26-5-43	21,600	13,324	8,280
			21,600	13,324	8,280
	D.—Oilseeds.				
10	Castor breeding, Hyderabad	30-9-41*	66,750	59,146	7,600
11	Groundnut breeding, Madras . . .	21-1-42*	52,900	41,412	11,490
12	Linseed breeding, Bengal .	30-9-41	21,880	17,585	4,300
13	Linseed breeding, Central Provinces . . .	9-2-42*	52,280	40,480	11,800
14	Rape and mustard breeding, Punjab . . .	31-8-41*	36,070	31,120	4,950
15	Coconuts, Madras . .	14-9-43	43,040	20,540	22,500
16	Coconuts—root disease, Travancore . . .	31-3-42*	53,180	37,272	15,910
			3,26,100	2,47,555	78,550
	E.—Tobacco.				
17	Sub-station, Guntur, I. A. R. I. . . .	31-8-41*	1,05,920	94,336	11,590
18	Training of officers . .	. .	25,500	17,898	7,600
19	Flue curing barns, Bombay	N. R.	2,500	1,250	1,250
			1,33,920	1,13,484	20,440

* Since extended.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
			Rs.	Rs.	Rs.
	F.—Fruits.				
20	Horticulture—				
	(*i*) Madras . . .	31-3-42*	87,310	78,048	9,260
	(*ii*) Bengal . . .	31-5-41*	61,530	61,073	460
	(*iii*) United Provinces	31-3-42*	2,09,080	1,75,310	33,770
	(*iv*) Punjab . . .	17-8-41*	57,430	44,827	12,600
	(*v*) Bihar . . .	31-3-42*	1,21,890	1,07,910	13,980
	(*vi*) N. W. F. P. . .	21-10-43	22,370	11,320	11,050
	(*vii*) Assam . . .	6-9-43	36,740	10,700	26,040
	(*viii*) Orissa . . .	13-11-42*	15,500	5,450	10,050
	(*ix*) Hyderabad . .	31-3-46	33,160	1,650	31,510
	(*x*) Mysore . . .	30-6-43	48,260	23,862	24,400
21	Papaya breeding, Bombay	1943	5,700	2,380	3,320
22	San Jose Scale Survey, Kashmir . . .	31-7-42*	17,760	8,370	9,390
23	Cold Storage, Bombay .	31-3-42	1,81,420	1,55,388	26,030
24	Fruit preservation—				
	(*i*) Punjab . . .	7-11-41*	34,370	27,798	6,570
	(*ii*) Baluchistan . .	1943	52,600	34,620	17,980
			9,85,120	7,48,706	2,36,410
	G.—Vegetables.				
25	Potato breeding, I. A. R. I.	31-3-41*	1,17,920	1,12,020	5,900
			1,17,920	1,12,020	5,900

*Since extended.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
	H.—Fibres.		Rs.	Rs.	Rs.
26	Sann hemp cultivation—				
	(*i*) Madras . . .	31-3-41*	2,100	2,065	40
	(*ii*) Central Provinces .	10-1-42*	10,660	8,028	2,630
			12,760	10,093	2,670
	I.—Other Crops.				
27	Coffee cultivation—Mysore . . .	28-2-42	9,500	3,450	6,050
28	Medicinal plants, Col. Chopra . . .	31-3-41*	80,360	79,374	990
29	Pan cultivation, Central Provinces . . .	30-4-45	13,470	..	13,470
			1,03,330	82,824	20,510
	J.—Soil Studies.†				
30	Lateritic soils, Dacca .	31-3-42	1,00,350	91,516	8,840
31	Colloid soil constituents, Calcutta . . .	31-10-43	81,370	57,317	24,050
32	Soil problems, Bengal .	31-3-41	37,940	35,449	2,490
33	The organic constituents of Indian soils, Calcutta	30-9-41	13,470	11,695	1,780
34	The preparation of cheap synthetic manure, Bangalore . . .	31-3-41*	21,430	18,196	3,230
35	The water requirements of crops, Punjab . .	31-1-43	71,400	21,560	49,840
36	Coastal soils, Calcutta .	31-8-42	15,310	7,370	7,940
37	Sub-surface investigations, Sind . . .	Nov. 1943	24,000	..	24,000
			3,65,270	2,43,103	1,22,170

*Since extended.

†The scheme regarding the pedological study of black cotton soils, Bhopal, sanctioned at a cost of Rs. 12,000 was withdrawn by the State.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
	K.—Agronomy.		Rs.	Rs.	Rs.
38	Dry Farming—				
	(*i*) Madras . . .	31-3-42*	1,71,090	1,37,564	33,520
	(*ii*) Bombay-Deccan .	31-3-42*	3,25,330	2,71,947	53,380
	(*iii*) Punjab . . .	31-3-42*	1,69,560	1,17,220	52,340
	(*iv*) Hyderabad-Deccan .	31-3-42*	81,550	63,672	17,880
39	Monograph on 'Dry Farming' . . .	31-7-41	5,700	2,983	2,720
			7,53,230	5,93,386	1,59,840
	L.—Physiology.				
40	Plant Physiology—Dr. Boshi Sen . . .	31-10-41*	24,730	21,625	3,100
41	Physiology of cane and wheat, Benares Hindu University . . .	31-3-42	67,920	50,910	17,010
			92,650	72,535	20,110
	M.—Entomology.				
42	Locust research . .	15-6-41	7,14,600	7,11,548	3 050
			7,14,600	7,11,548	3,050
	N.—Mycology.				
43	Virus diseases—Bombay .	1943-44	85,470	43,187	42,280
			85,470	43,187	42,280
	O.—General.				
44	Sub-Station, Pusa . .	31-3-41*	2,63,930	2,52,924	11,010
45	Expansion at the I. A. R. I.	July 1945	2,50,000	24,590	2,25,410
46	Kans eradication, Bhopal .	31-3-43	5,000	..	5,000
			5,18,930	2,77,514	2,41,420
	Total Agri. Schemes .		56,14,390	45,28,360	10,86,03

*Since extended.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
			Rs.	Rs.	Rs.
	II.—ANIMAL HUSBANDRY.				
	A.—Cattle Breeding.				
1	Herd books and pedigree registration of cattle—Punjab . . .	30-4-44	13,420	..	13,420
2	Training in animal genetics . . .	..	9,100	5,563	3,540
			22,520	5,563	16,960
	B.—Goat and Sheep Breeding.				
3	Goat breeding—Dr. Slater.	5-6-41*	63,190	63,007	180
4	Goat breeding—Punjab .	Oct. '44	18,720	5,850	12,870
5	Sheep breeding—Madras .	22-10-43	18,000	7,968	10,030
6	Sheep breeding—				
	(*i*) Bombay . . .	31-10-47	76,390	35,154	41,240
	(*ii*) Purchase of extra Deccan Plateau sheep . . .	N. R.	4,700	1,060	3,640
	(*iii*) Development of scientific research work on sheep breeding . . .	22-12-43	6,900	3,789	3,110
7	Sheep breeding—Punjab .	Oct. 46	43,000	17,550	25,450
8	Sheep breeding—Mysore .	31-10-43	7,200	1,408	5,790
	Sheep breeding—Kashmir	31-3-43	11,700	..	11,700
			2,49,800	1,35,786	1,14,010

*Since extended.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
	C.—Animal Nutrition.		Rs.	Rs.	Rs.
10	Animal Nutrition—Madras . . .	31-3-42*	69,930	52,350	17,580
11	Animal Nutrition—Bengal	31-12-41*	1,26,660	1,14,204	12,460
12	Feeding of cattle on departmental farms—U. P.	Apl.'43	1,01,520	37,800	63,720
13	The feeding values of certain food grains, oilseeds and cakes for heifers—Punjab . .	31-3-42*	22,840	7,000	15,840
14	Feeding value of indigenous fodders—Bihar . .	30-9-41*	25,470	21,660	3,810
15	Animal Nutrition—Assam. . . .	Feb.'44	45,000	..	45,000
			3,91,420	2,33,014	1,58,410
	D.—Animal Pests and Diseases and Cure.				
16	Veterinary Investigation Officers—*				
	(*i*) Madras . . .	31-3-41		68,164	
	(*ii*) Bombay. . .	31-3-41		75,741	
	(*iii*) Bengal . . .	31-3-41		73,375	
	(*iv*) United Provinces .	31-3-41		61,045	
	(*v*) Punjab . . .	31-3-41		69,520	
	(*vi*) Bihar . . .	31-3-41		66,672	
	(*vii*) Central Provinces .	31-3-41	8,00,660	69,260	98,170
	(*viii*) Assam . .	31-3-41		52,740	
	(*ix*) Orissa . . .	31-3-41		13,200	
	(*x*) N.-W. F. P. . .	31-3-41		43,797	
	(*xi*) Sind and Ajmer-Merwara . . .	1-1-42		30,719	
	(*xii*) Hyderabad . .	31-3-41		78,262	

*Since extended.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
17	Johne's disease among cattle, Mysore . .	31-3-41*	Rs. 25,130	Rs. 24,735	Rs. 390
18	Tuberculosis and Johne's disease among animals, I. V. R. I. . . .	Feb.'44	1,02,200	393	1,01,810
19	Contagious abortion in cattle, goats and sheep, I. V. R. I.	24-5-42	76,720	14,300	62,420
20	Helminthiasis, United Provinces	9-2-42*	21,160	16,536	4,620
21	Survey of helminth infection in India—				
	(*a*) I. V. R. I. . .	31-10-42	6,100	..	6,100
	(*b*) U. P. . . .	1942	6,100	3,050	3,050
22	Helminthiasis, C. P.. .	1942	5,600	1,085	4,520
23	Helminthiasis of cattle—Madras	31-5-44	10,100	2,720	7,380
24	A systematic protozoologist, I. V. R. I. .	17-8-41	42,700	28,697	14,000
25	Warble flies, I. V. R. I. .	31-12-41	29,170	14,265	14,900
26	Control of ticks, Bombay .	14-1-42*	35,700	7,530	28,170
27	Indigenous drugs of India	18-7-43	39,000	9,900	29,100
	E.—Dairying.		12,00,340	8,25,706	3,74,630
28	The manufacture of products and bye-products of milk, Anand . .	31-3-47	95,860	3,232	(*a*) 92,630
29	Milk recording societies—				
	(*i*) Madras . . .	2-1-42 (abeyance).	960	255	710
	(*ii*) Bombay . . .	30-9-41*	1,140	820	320
	(*iii*) United Provinces .	30-9-41*	1,410	1,197	210
	(*iv*) Punjab . . .	30-4-41	2,880	2,470	410
	(*v*) Sind . . .	1942	1,080	..	1,080
			1,03,330	7,974	95,360

*Since extended.

(*a*) These balances have since been resumed by the Council.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
			Rs.	Rs.	Rs
	F.—Poultry.				
30	Poultry Husbandry—Bombay	30-9-41*	47,400	41,593	5,810
31	Poultry for table purposes —Punjab . . .	Nov. '42	12,370	6,810	5,560
32	Diseases of poultry—				
	(*i*) I. V. R. I. . .	9-2-44	37,500	..	37,500
	(*ii*) Madras . . .	Nov. '43	5,950	750	5,200
	(*iii*) Bombay . .	Feb. '44	6,300	350	5,950
	(*iv*) United Provinces .	Oct. '44	6,300	..	6,300
	(*v*) Bihar . . .	Aug. '43	6,300	1,000	5,300
	(*vi*) N.-W. F. P. . .	July '43	6,300	1,190	5,110
	(*vii*) Mysore . . .	Feb. '44	14,700	..	14,700
			1,43,120	51,693	91,430
	G.—Fish.				
33	Fresh water fishes—Calcutta . . .	31-3-41*	11,470	11,228	240
			11,470	11,228	240
	H.—Wool.				
34	Wool analysis—Bombay University . . .	31-7-43	13,700	2,700	11,000
35	Laboratory for wool analysis—Bombay . .	11-12-43	5,900	500	5,400
			19,600	3,200	16,400
	I.—Hides & Skins.				
36	Mechanical flaying of hides.	..	1,300	..	(*a*)1,300
			1,300	..	1,300

*Since extended.

(*a*) These balances have since been resumed by the Council.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
	J.—Animal Husbandry Bureau.		Rs.	Rs.	Rs.
37	Animal Husbandry Bureau	10-4-42*	65,420	55,937	9,480
			65,420	55,937	9,480
	Total A. H. Schemes(*b*) .		22,08,320	13,30,101	8,78,220
	III.—COMBINED AGRICULTURE AND ANIMAL HUSBANDRY SCHEMES.				
	A.—Fodder and Grazing.				
1	Training of officer . .	(*a*)	8,000	..	8,000
			8,000	..	8,000
	B.—Statistics.				
2	Experimental errors in field trials, Statistical Institute, Calcutta University .	30-6-42*	97,220	77,613	19,610
3	Tables for D^2 Statistics, Calcutta University .	1941	2,000	1,000	1,000
4	Statistical section of the Council	31-3-41*	1,50,560	1,40,708	9,850
			2,49,780	2,19,321	30,460
	Total Combined Agriculture and A. H. Schemes .		2,57,780	2,19,321	38,460

*Since extended.

(*a*) The deputation has been postponed owing to the present war conditions in Europe.

(*b*) (*i*) The Orissa fish scheme sanctioned for 1 year at a cost of Rs. 21,000 was withdrawn by the Provincial Govt.

(*ii*) A sum of Rs. 500 originally sanctioned for affiliation to the International Dairy Federation was withdrawn and the scheme postponed *sine die*.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
	IV.—GENERAL.		Rs.	Rs.	Rs.
	A.—Contributions to International and Imperial Bureaux of Agriculture and Veterinary Research and Indian Institutes of Science.				
1	To the International Office des Epizootics, Paris .	31-3-45	63,910	35,088	28,820
2	To the International Institute of Agriculture .	31-3-43	1,90,690	1,49,824	40,870
3	To the Imperial Agricultural Bureaux . .	31-3-42*	1,39,130	83,475	55,650
4	To the Imperial Institute of Mycology . . .	31-3-42*			
5	To the Imperial Institute of Entomology . .	31-3-42*	59,330	34,160	25,170
6	Towards maintenance of the Farnham House Laboratory . . .	31-3-42*			
7	To the Imperial Bureau of Dairy Science . .	31-3-42*	11,820	7,088	4,730
8	To the Fruit Preservation Research Station, Campden	31-3-41*	2,000	1,333	670
9	To the Tobacco Federation of the British Empire .	31-3-41*	1,060	933	130
10	To the Indian Society of Soil Science . . .	31-3-43	2,250	750	1,500
			4,70,190	3,12,651	1,57,540
	B.—Library & Publication.				
11	Books and Publications .	31-3-42*	84,400	72,114	12,290
12	Editorial staff for Indian Farming . . .	31-3-41*	19,600	19,596	*Nil*
13	Editorial Committee .	..	5,810	4,688	1,120
			1,09,810	96,398	13,410

*Since extended.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
	C.—Headquarters Miscellaneous Schemes, etc.		Rs.	Rs.	Rs.
14	Accounts and Audit .	Standing charge.	91,250	91,254	*Nil*
15	Travelling allowance of non-official members of the Council. . . .	Do.	71,490	71,488	*Nil*
16	Travelling allowance of visitors for attending meeting of the Advisory Board and the Committees of the Council . .	Do.	74,810	74,808	*Nil*
17	Miscellaneous . . .	Do.	15,690	15,650	*Nil*
			2,53,240	2,53,239	*Nil*
	Total General		8,33,240	6,62,288	1,70,950
	V.—Sugar Schemes.				
	A.—Breeding and Agronomy.				
1	Karnal Station, I. A. R. I.	31-3-42	1,78,730	1,17,495	61,230
2	Anakapalle and Gudiyattam, Stations, Madras .	31-3-42	1,87,130	1,32,484	[54,650
3	Padegaon Station, Bombay	31-5-42	5,93,300	5,06,169	[87,130
4	Dacca Station, Bengal .	11-11-41	24,850	21,397	3,450
5	(*i*) Seedling examination —U. P. . . .	31-8-41	11,230	11,055	180
	(*ii*) Muzaffarnagar Station —U. P. . . .				
	(*iii*) Shahjahanpur Station —U. P.* . . .	15-1-42	2,03,760	1,72,894	30,870
6	Lyallpur Station, Punjab .	31-1-42	2,15,800	1,87,641	28,160
7	Pusa Station, Bihar* .	17-3-42	3,72,250	3,16,636	55,610
8	Jorhat Station, Assam .	31-3-42	61,400	57,552	3,850

*Since extended.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
			Rs.	Rs.	Rs.
9	Tarnab Station, N. W. F. P.	1-1-45	63,750	20,900	42,850
10	Hebbal Station, Mysore	31-1-42	45,120	35,884	9,240
11	Vyara Station, Baroda	15-11-41	11,300	10,360	940
12	Ratooning Experiments—				
	(*i*) U. P.	31-12-43	29,500	15,138	14,360
	(*ii*) Bihar	18-3-44	29,500	12,120	17,380
13	Reclamation of Usar, U. P.	14-1-42	10,000	5,800	4,200
14	Sugarcane genetics, I. A. R. I.	25-5-42	61,530	41,769	19,760
15	Sugarcane Chemistry, I. A. R. I.	4-5-41	23,000	17,976	5,020
16	Sugarcane and gur yields, U. P.	7-11-43	50,000	9,100	40,900
			21,72,150	16,92,370	4,79,780
	B.—Pests and Diseases.				
17	Insect pests, I. A. R. I.	30-11-42	1,94,800	1,38,126	56,670
18	Borer Survey—*				
	(*i*) I. A. R. I.	30-9-41		*Vide* (item No. 19.)	
	(*ii*) Madras	30-9-41		9,400	
	(*iii*) Bombay	30-9-41		10,310	
	(*iv*) Bengal	30-9-41		13,640	
	(*v*) U. P.	30-9-41	2,13,880	27,291	1,20,220
	(*vi*) Punjab	30-9-41		10,960	
	(*vii*) Bihar	30-9-41		15,455	
	(*viii*) Orissa	30-9-41		3,600	
	(*ix*) Indian Statistical Institute	30-9-41		3,000	
19	Mosaic and other diseases, I. A. R. I.	31-5-42	2,16,880	1,61,926	54,960
			6,25,560	3,93,708	2,31,850

*Since extended.

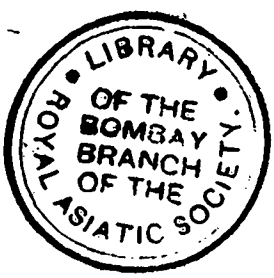
Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
			Rs.	Rs.	Rs.
	C.—Technology.				
20	Bilari Testing Station .	(a) 30-11-41	1,69,980	1,45,300	24,680
21	Grading of gur and boora .	31-3-42	2,890	470	2,420
22	Manufacture of sugar candy	28-2-44	30,520	6,000	24,520
			2,03,390	1,51,770	51,620
	D.—Miscellaneous.				
23	Sugar Committee . .		48,360	48,358	*Nil*
			48,360	48,358	*Nil*
	Total Sugar Schemes (b) .		30,49,460	22,86,206	7,63,250
	VI.—Marketing Scheme.				
1	Provincial marketing scheme	(a) 31-3-41	11,80,000	11,35,552	44,450
			11,80,000	11,35,552	44,450
	VII.—Cold Storage Scheme.				
1	Cold Storage scheme. . .	..	1,00,000	42,317	57,680
			1,00,000	42,317	57,680
	Schemes in progress—				
	Agriculture . . .	..	56,14,390	45,28,360	10,86,030
	Animal Husbandry .	..	22,08,320	13,30,101	8,78,220
	Combined Agri. & A. Husbandry . .	..	2,57,780	2,19,321	38,460
	General . . .	..	8,33,240	6,62,288	1,70,950
			89,13,730	67,40,070	21,73,660

(a) Since extended.

(b) The scheme regarding the deputation of Mr. K. L. Khanna to Rothamsted sanctioned at a cost of Rs. 8,000 was withdrawn by the Bihar Government.

Serial No.	Name of scheme.	Date of termination of scheme.	Sanctioned grant.	Actual expenditure up to 1940-41.	Balance available after 1940-41.
1	2	3	4	5	6
			Rs.	Rs.	Rs.
	Sugar	..	30,49,460	22,86,206	7,63,250
	Marketing . . .	..	11,80,000	11,35,552	44,450
	Cold Storage . . .	..	1,00,000	42,317	57,680
	Total of schemes in progress	..	1,32,43,190	1,02,04,145	30,39,040
	Total of completed schemes* . . .	..	31,73,690	31,73,687	
	Grand Total .		1,64,16,880	1,33,77,832	30,39,040

*Schemes completed before 1-4-41.



APPENDIX VIII.

Financial resources of the I. C. A. R. and allocation of funds up to 31st March 1941.

Funds received and receivable 1929-30 to 1940-41.			Funds allotted.		
Serial No.	Particulars.	Amount.	Serial No.	Particulars.	Amount.
		Rs.		I. SCHEMES IN PROGRESS.	Rs.
				Agricultural Schemes.	
1	Grants from Central Govt.—		1	Rice	10,30,970
			2	Wheat and Barley	3,52,520
	(i) General	83,60,800	3	Millets and Pulses	21,600
			4	Oilseeds	3,26,100
	(ii) Sugar	34,42,200	5	Tobacco	1,33,920
			6	Fruits	9,85,120
	(iii) Marketing	11,80,000	7	Vegetables	1,17,920
	(iv) Cold Storage.	1,00,000	8	Fibres	12,760
2	Contribution from Constituent States.	4,25,000	9	Other Crops	1,03,330
			10	Soil Studies	3,65,270
3	Receipts under the Agricultural Produce Cess Act.	8,28,300	11	Agronomy	7,53,230
			12	Physiology	92,650
4	Miscellaneous income receipts and recoveries.	22,05,700	13	Entomology	7,14,600
			14	Mycology	85,470
			15	General	5,18,930
	Total c/o	1,65,42,000		Total Agricultural Schemes	56,14,390
				Animal Husbandry Schemes.	
			1	Cattle Breeding	22,520
			2	Goat and Sheep Breeding	2,49,800
			3	Animal Nutrition	3,91,420
			4	Animal Pests and Diseases and Cure.	12,00,340
			5	Dairying	1,03,330
			6	Poultry	1,43,120
			7	Fish	11,470
			8	Wool	19,600
			9	Hides and Skins	1,300
			10	Animal Husbandry Bureau	65,420
				Total Animal Husbandry Schemes.	22,08,320

Funds received and receivable 1929-30 to 1940-41.			Funds allotted.		
Serial No.	Particulars.	Amount.	Serial No.	Particulars.	Amount.
	Brought Forward	Rs. 1,65,42,000		*Combined Agriculture and Animal Husbandry Schemes.*	Rs.
			1	Fodder and Grazing .	8,000
			2	Statistics . . .	2,49,780
				Total combined Agriculture and A. H. Schemes.	2,57,780
				Other General Schemes.	
			1	Contributions to International and Imperial Bureaux, etc.	4,70,190
			2	Library and Publications	1,09,810
			3	Headquarters Miscellaneous Schemes.	2,53,240
				Total Other General Schemes.	8,33,240
				Sugar Schemes.	
			1	Breeding and Agronomy	21,72,150
			2	Pests and Diseases . .	6,25,560
			3	Technology . . .	2,03,390
			4	Miscellaneous . . .	48,360
				Total Sugar Schemes .	30,49,460
				Marketing Scheme.	
			1	Provincial Marketing Scheme.	11,80,000
				Cold Storage Scheme.	
			1	Cold Storage Scheme .	1,00,000
				Total Schemes in progress	1,32,43,190
				II.—Total Schemes completed before 1st April 1941.	31,73,690
				GRAND TOTAL . .	1,64,16,880
				Unallotted balance . .	1,25,120
	Total .	1,65,42,000		Total .	1,65,42,000

APPENDIX IX.

Action taken on the recommendations of the Sugar Committee June 1940 Meeting.

Serial No.	Brief subject.	Recommendation in brief.	Decision of the Governing Body.	Action taken.	Remarks.
1	2	3	4	5	6
1	Scheme for the treatment of sugar factory effluents and conversion of molasses into manure (I. I. S. T.).	A Chemist should be appointed at the Imperial Institute of Sugar Technology for two years.	Approved . .	Necessary sanction communicated.	The scheme has held over for want of co-operation from factories.
2	Scheme for investigating feeding value of molasses (I. V. R. I.).	Recommended for sanction . .	Rs. 10,000 sanctioned for preliminary feeding experiments for a period of six months.	Sanction communicated.	
3	Research on factors forming the basis for grading of *Gur* and *Rab* (I. I. S. T.).	Ditto .	Approved (Rs. 10,000 for 3 years).	Sanction communicated.	
4	Scheme for enlarging the scope of the I. I. S. T. to include confectionery, etc.	Being considered along with the proposal for the extension of the term of the Imperial Institute of Sugar Technology.			
5	Scheme for grading of *Gur* and *Boora* submitted by the Agricultural Marketing Advisor.	Recommended for sanction with slight modifications.	Approved (Rs. 2,640 for a period of one year from 9-9-40).	Sanction communicated.	
6	Sugarcane research scheme, Sind .	Recommended with slight modifications	Approved . .	Sanction communicated.	

7	*Retention of the post of Statistical Assistant at the Sugarcane Research Station, Pusa.*	Recommended	Do. . .	Do.
8	U. P. Soil Survey Scheme . .	Referred to the Special Committee for re-organisation of sugarcane research.	Referred to the Economic Committee.	..
9	Additional staff at the I. A. R. I. for Red-Rot survey in the United Provinces.	Recommended that for the present the scheme should carry on its work with the personnel already sanctioned and that the matter of the allocation of work on Red-Rot as between the Centre and the Provinces be referred to the Special Committee for re-organisation of sugarcane research.	....	1. Additional Staff sanctioned up to 31st May, 1942. 2. The question of allocation of work as between the Centre and the Provinces will be referred to the A. B. at its autumn session, 1941.
10	Aligarh Muslim University Scheme for research on biology of sugarcane pests.	Recommended with modifications .	Approved . .	Sanction communicated.
11	Establishment of a Central Station for sugarcane research.	Recommended for the establishment of one Central Station in the U. P. and another in Bihar for the present. The scheme should be examined in detail by a Special Committee.	Do.	..
12	Scheme for research on Chemistry of sugarcane—Extension sanctioned by Vice-Chairman.	Action taken by Vice-Chairman confirmed.	Do.	..
13	Sugarcane Research Station Bilari— (*a*) Extension. (*b*) Publicity of the results of research. (*c*) Training in indigenous methods of *gur* and sugar manufacture.	Recommended	Do.	Sanction communicated.

Serial No.	Brief subject.	Recommendation in brief.	Decision of the Governing Body.	Action taken.	Remarks.
1	2	3	4	5	6
14	Bureau of Sugar Standards—taking over by the Government of India.	Noted	Noted.	..	
15	Extension of the term of the Imperial Institute of Sugar Technology.	The Institute should be made permanent.	....	Recommendation communicated to the Central Government.	
16	Progress Reports . . .	Approved with certain remarks . .	....	Remarks communicated to all concerned.	
17	Technical programme of Sugar Candy.	Approved	....	The Director, Imperial Institute of Sugar Technology, informed.	
18	Technical programme of the sugarcane insect pests scheme (central portion).	Referred to a Special Committee to be appointed by the Vice-Chairman.	....	Approved subject to further examination by the Sugar Committee.	
19	Note by the Agricultural Commissioner on the Control of insect pests of sugarcane.	The note should be brought to the notice of all sugarcane research workers.	....	Circulated to the Directors of Agriculture, Director, I. A. R. I., etc.	
20	Note by the Director, I. A. R. I., on experiments on use of molasses and Press-mud as manure.	Material should be sent to a few experimental stations for carrying out properly laid out trials to confirm the results— Resume of work on molasses should be published after suitable modifications and circulated to factory owners and others for information.	....	The recommendations have been communicated to the Directors, I. I. S. T. and I. A. R. I.	

		The problem should be linked up with Serial No. 1 above.		
21	Notes by the Director of Agriculture, Bihar, on (*a*) insect pests in general, (*b*) *Pyrilla* circular and (*c*) Red Rot.	(*a*) is covered by Serial No. 18 above (*b*) such warning circulars having a scientific value should first go to the Provincial Departments of Agriculture (*c*) should be referred to the Special Entomologists Committee to be appointed by Vice-Chairman to consider Serial No. 18 above.	....	Noted.
22	Note as the results of 3 years' experiments in Biological Control of Sugarcane Pests by the Director, I. A. R. I.	No comments	....	Comments of the Special Sugarcane Ent. Comtt. communicated to the Director, I. A. R. I.
23	Importation of promising varieties of sugarcane from abroad.	Exchange of sugarcane varieties between Coimbatore and foreign stations should be strictly reciprocal, but in the case of Florida canes attempt should be made to obtain them on payment, if necessary.	....	Recommendation communicated to the Director, I. A. R. I. through the Education, Health and Lands Department.
24	Submission by the Provincial Governments and the Indian States concerned of figures showing (i) the average yield of sugarcane per acre and (ii) the gur/cane ratio.	The draft form of the statement to be submitted to the Director General, Commercial Intelligence and Statistics approved.	....	Recommendation communicated to all concerned.
25	Devising of a system to help the cultivator in increasing the yield of cane.	1. Collaboration between the agriculture departments and the research workers and factories should be developed in all cane-growing provinces and States in forms suitable to local conditions.	....	Ditto

Serial No.	Brief subject.	Recommendation in brief.	Decision of the Governing Body.	Action taken.	Remarks.
1	2	3	4	5	6
		2. Research stations should distribute their varieties to factory farms at the same time as they are distributed to Government farms. 3. Agricultural Departments should put out for the information of co-operative societies, factories and cultivators, a table showing manurial value of oilseeds, so that if the oil cakes come within their price limits they could get them.			
26	Question whether detailed summary of the proceedings of the Sugar Committee may be supplied to the Indian Sugar Syndicate and others.	A copy of the agenda and proceedings may be supplied to the Indian Sugar Syndicate and other Associations represented on the Sugar Committee for their official and confidential use as is done in the case of the Indian Sugar Mills Association.	....	Noted.	
27	Problem of the over-production of sugarcane.	There was no discussion on the item.	....	....	
28	Time and place of the next meeting of the Sugar Committee.	Should be held in October-November 1940.	....	This has been done.	
29	Date of appointment of the next Tariff Board.	Noted . .	....	No action.	
30	Note by the Agricultural Commissioner on the Soil Analysis work carried out at various sugarcane research stations.	Should be considered by the Special Committee, for the re-organisation of sugarcane research in India.	Recommendations of the Special Committee should first be referred to the Economic Committee.	Linked up with the Central Sugarcane Research Stations.	

31	*Manufacture of Power Alcohol* from molasses.	*Noted*	. . . .	No action.
	Resolutions.			
32	Time of assignment of suitable zones to factories.	Suitable zones should be assigned to factories at the time of planting and not when it is ready for harvest and that for the coming season zones should be fixed up not later than the 31st August 1940 and the cultivators be informed about it in time.	. . . .	Provincial Governments have been informed.
33	Railway freight on *Gur* and *Rab* .	Suitable recommendations should be made to the Railway Board to decrease the freight rate of *Gur* and *Rab*.	. . . .	Proposals submitted to the Railway Board.
34	Equipment of research stations with apparatus for recording meteorological data.	Every research station should be equipped with suitable apparatus to record different meteorological data in connection with germination, tillering, plant growth, development of sucrose contents in cane, etc., so that a better approach in connection with agricultural practices may be possible. In the planning of meteorological observations and in correlation of meteorological data with experimental results the collaberation of Dr. Ramdas of the Agricultural Meteorological Section of the Meteorological Department should be obtained.	. . . .	Communicated to all Provincial Governments, etc.
35	Testing of new varieties of factory farms.	The factory farms should be freely used for the purpose of testing new varieties. In testing new varieties the co-operation of big private farmers should also be secured provided that they agreed to undertake to test the varieties on the same conditions on which the factories undertake the work.	. . . .	Communicated to all Provincial Governments, etc.

Serial No.	Brief subject.	Recommendations of the Sugar Committee.	Decision of the Governing Body.	Action taken.	Remarks
1	2	3	4	5	6
1	Central Station for Sugarcane Research for South India, Padegaon.	For want of funds the proposals should be postponed for the present.	....	Decision communicated.	
2	Appointment of a Physiologist at Coimbatore.	Recommended upto 31st March 1944 (Cost Rs. 15,880).	Will be submitted to the G. B. in July, 1941.		
3	Breeding of suitable types of canes for Gujerat—extension scheme.	Full details of the programme of work should in the first instance be called for.	....	Detailed programme received from Baroda Government and was examined by the Plant Management (Agronomic) Committee in April 1941. Its report will be submitted to the Sugar Committee at its next meeting.	
4	Application from the Government of the N. W. F. P. for additional staff for the sugarcane research scheme.	Not recommended	....	Application withdrawn by the Provincial Government.	
5	Date of termination of the different centres of the regional section of the scheme on insect pests of sugarcane.	That the regional stations be continued upto the 30th September 1941, pending examination of the working of the scheme by a special sub-committee to be appointed by the V. C. at an early date.	....	The special sub-committee met in March 1941 and made certain changes in the technical programme. The question of continuance of the survey beyond 30th September 1941 will be considered at its next meeting to be held after 15th June 1941.	

6	Programme of the survey of yield and gur/cane ratio of sugarcane for investigation of the crop sampling technique (U. P.).	The subject being too technical should be discussed personally by the A. C. and the V. C. with Prof. Mahalanobis and the programme modified if necessary.	....	Certain modifications suggested by the sub-committee were approved by the A. B. and conveyed to the U. P. Government.
7	Technical programme of central Stations for sugarcane research in the U. P. and Bihar.	Approved with the remark that the aim of the researches should be the working out of cultivation schedules to suit varying conditions of seasons, soils and climates.	....	Comments communicated to Provincial Governments concerned.
8	Technical programme of the N. W. F. P. sugarcane research scheme.	Should be revised in consultation with the A. C.	....	Programme revised.
9	Progress Reports—1939-40.—			
	(i) Hyderabad sugarcane research scheme Rudrur—Summary of results of the experiments conducted during 1939-40.	Approved with certain remarks. .	....	Comments communicated to Research workers.
	(ii) Punjab	Approved with certain remarks . .	....	
	(iii) Sub-station, Karnal . .	Approved with certain remarks .	....	
	(iv) Sugarcane Geneticist, Coimbatore.	Approved with certain remarks . .	....	
	(v) Diseases of sugarcane, I. A. R. I.	Approved with certain remarks . .	....	
	(vi) Baroda	Approved with certain remarks .	....	
	(vii) U. P.	Approved with certain remarks . .	....	
	(viii) Padegaon, Bombay . .	Approved	....	
	(ix) Report on the survey of sugarcane borers in the U. P.	In the Special Sugarcane Committee it had already been ruled that reports such as this were redundant and need not be prepared.	....	The special sub-Committee decided in March 1941 that a consolidated report should be prepared by the 2nd Ent., I. A. R. I.

Serial No.	Brief subject.	Recommendations of the Sugar Committee.	Decision of the Governing Body.	Action taken.	Remarks.
1	2	3	4	5	6
10	Final report on the work done on insulation and press boards from bagasse—Indian Forest Research Institute. Notes by Dr. H. H. Dodds entitled (1) Report on the celotex process (2) Outline of a process of manufacture of celotex.	More details should be called for from the F. R. I. and thereafter the Council should publish a self-contained monograph incorporating the notes of Dr. Dodd and containing information both about celotex and other methods.	....	Details obtained and monograph is under preparation.	
11	Resolutions passed by the Indian Sugar Mills Association *re* intensification of work of improvement of Sugarcane cultivation.	(*a*) The Sugar Committee recommends that a reply may be sent informing the Indian Sugar Mills Association that, so far as the Council is concerned, it has already sanctioned a number of schemes calculated to improve the methods of cane cultivation involving an expenditure of over Rs. 28 lakhs in the past few years and that, with a view to accelerate the work of improvement, it has recently set up a committee which is going into the question of further research to be undertaken at the Central Research Stations proposed to be established at an early date.	....	Indian Sugar Mills Association has been informed accordingly.	
		(*b*) In this connection, the Sugar Committee recommends that the Council should move the Provincial Governments for taking suitable steps in order to carry the results of these researches to the cultivators and to provide more money for the purpose.	....	Provincial Governments addressed.	

	(c) This Committee also recommends to the Government of India that a sum of at least Rupees twenty-five lakhs per annum be granted to enable proper research on sugarcane to be carried on in the different provinces.	....	Not accepted by the Government of India.
	(d) The Committee further recommends that an analysis should be made of the results of sugarcane research.		Results already analysed in the Bulletin. " Summary of some practical results of sugarcane research in India".
	(e) The Committee also recommends that a report should be put up in a summarised form indicating how the results so far achieved can be translated into cultivators' practice with the object of improving the system of cane cultivation and reducing its cost and steps should be taken at an early date to give effect to the same.	....	Data is being collected from Provincial Governments.
	(f) This Committee having been reliably informed that in the provinces of the U. P. and Bihar it is necessary to give suitable loans to the cultivators of sugarcane to enable them to use proper and sufficient manure, recommends to the Governments of the U. P. and Bihar that adequate measures be taken by them for the purpose, so that it may be rendered possible for the yield of cane per acre and the sucrose content of cane to be increased and thereby cane and sugar be made cheaper. It also recommends to the Government of India that it should help the Provincial Governments with loans, if necessary.	....	Communicated to the Governments concerned.

Serial No.	Brief subject.	Recommendations of the Sugar Committee.	Decision of the Governing Body.	Action taken.	Remarks.
1	2	3	4	5	6
12	Resolutions of Mr. Abdul Latif Beg :— (1) This Committee recommends to the Governments of the U. P. and Bihar that prices of sugar of the next season should not be fixed in such a way that it may bring down the prices of gur to an uneconomic level and for that it is desirable that whatever be the price of cane, the price of sugar should not be less than Rs. 9-8. (2) This Committee recommends to the Governments of the U. P. and Bihar that the prices of sugar fixed for the season should not go down till the next season begins.	*Resolution No. (1)* withdrawn by the mover. *Resolution No. (2)* the Committee recommended that the resolution be forwarded to the Governments of the U. P. and Bihar with the remark that they were not in a position to express any opinion about it.	....	Forwarded to the Provincial Governments.	

APPENDIX X

PUBLICATIONS OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, INDIA

[Prices are inclusive of packing and Indian postage]

1. Indian Farming

An illustrated monthly magazine dealing with agriculture, animal husbandry, rural development and allied subjects throughout the Indian Empire. It is a popular and authoritative publication giving in an easily assimilable form the knowledge gained by scientific research and its application to practical farming in the provinces and states of India. (Prepayable subscription Rs. 6 or 9*s*. 6*d*. per annum. Price per part 8 annas). Vol. I complete is available.
(Replaced 'Agriculture and Livestock in India' with effect from 1940. Vols. I—IX of Agriculture and Livestock in India are available.)

2. The Indian Journal of Agricultural Science

ICAR. 5. A bi-monthly scientific journal of agriculture and the allied sciences mainly devoted to the publication of the results of original research and field experiments. (Established 1931. Published in February, April, June, August, October and December. Prepayable subscription Rs. 15 or 23*s*. 6*d*. per annum. Price per part Rs. 3 or 5*s*. 3*d*. Volumes I to IX complete are available.

3. The Indian Journal of Veterinary Science and Animal Husbandry

ICAR. 6. A quarterly journal for the publication of scientific matter relating to the health, nutrition and breeding of livestock. (Established 1931. Published in March, June, September and December. Prepayable subscription Rs. 6 or 9*s*. 6*d*. Price per part Rs. 2 or 3*s*. 6*d*.) Volumes I to IX complete are available.

4. Scientific Monographs of the Imperial Council of Agricultural Research

ICAR. 10-1. No. 1. The Fungi of India. By E. J. Butler, C.I.E., D.Sc., M.B., F.R.S., and G. R. Bisby, Ph.D. (1931). Price Rs. 6-12 or 11*s*.

ICAR. 10-2. No. 2. Life-histories of Indian Microlepidoptera, Second Series: Alucitidæ (Pterophoridæ, Tortricina and Gelechiadæ). By T. Bainbrigge Fletcher, R.N., F.L.S., F.E.S., F.Z.S. (1932). Price Rs. 3-4 or 5*s*. 6*d*.

ICAR. 10-3. No. 3. The Open Pan System of White Sugar Manufacture. By R. C. Srivastava, B.Sc. (1935, 2nd edition.) Price Rs. 3-2 or 5*s*. 6*d*.

ICAR. 10-4. No. 4. Life-histories of Indian Microlepidoptera; Cosompterygidæ to Neopseustidæ. By T. Bainbrigge Fletcher, R.N., F.L.S., F.E.S., F.Z.S. (1933). Price Rs. 4-8 or 7*s*. 6*d*.

ICAR. 10-5. No. 5. The Bombay Grasses. By E. J. Blatter, S.J., Ph.D., F.L.S. and C. McCann, F.L.S. Illustrated by R. K. Bhide. (1935). Price Rs. 20-12 or 32*s*. 6*d*.

ICAR. 10-6. No. 6. Helminth Parasites of the Domesticated Animals in India. By G. D. Bhalerao, M.Sc. (1935). Price Rs. 7-12 or 13*s*. 3*d*.

ICAR. 10-7. No. 7. Influence of Manures on the Wilt Disease of *Cajanus indicus* Spreng., and the Isolation of Types Resistant to the Disease. By W. McRae, M.A., D.Sc. (Edin.), F.L.S. and F. J. F. Shaw, D.Sc. (Lond.), A.R.C.S., F.L.S. (1933). Price Rs. 2-4 or 4*s*. 3*d*.

ICAR. 10-8. No. 8. The Silk Industry of Japan with Notes on Observations in the United States of America, England, France and Italy. By C. C. Ghosh, B.A., F.E.S. (1933). Price Rs. 4 or 6*s*. 9*d*.

ICAR. 10-9. No. 9. Mechanical Cultivation in India. A History of the Large-scale Experiments carried out by Burmah-Shell Oil Storage and Distributing Company of India, Ltd. By C. P. G. Wade. (1935). Price Rs. 3-14.

ICAR. 10-10. No. 10. The Spotted Boll-Worms of Cotton (*Earias fabia* Stoll and *Earias insulana* Boisd) in South Gujarat, Bombay Presidency. (Final Report on investigations financed by the Indian Central Cotton Committee, 1923-1931). By B. P. Deshpande, M.Ag. and N. T. Nandkarny, B.Ag. (1936). Price Rs. 5-14 or 9*s*. 6*d*.

ICAR. 10-11. No. 11. Investigations on the Course and Distribution of the Nerves supplying Levator anguli scapuli and Rhomboideus muscles and the Formation of the Phrenic Nerve in the Ox with Observations on certain Anatomical Deviations. By H. N. Chelva Ayyangar, G.M.V.C. (1937). Price Rs. 4-10 or 7*s*. 9*d*.

ICAR. 10-12. No. 12. The Fungi of India, Supplement I. By B. B. Mundkur. (1938). Price Re. 1-6 or 2*s*. 3*d*.

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11. Miscellaneous

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GLOSSARY.

Aman paddy . . Winter rice (sown at the end of the rains and harvested in November).

Ata . . . . Whole-meal flour.

Aus paddy . . . Early rice (sown with the early rains and harvested in August).

Babul . . . . *Acacia arabica.*

Bajra . . . . Pearl millet (*Pennisetum typhoideum*).

Ber . . . . Indian jujube (*Zizyphus jujuba*).

Bhasamanik . . . Name of a variety of paddy in Bengal.

Bhindi . . . . *Hibiscus esculentus.*

Bhondu . . . Name of a variety of paddy in the C. P.

Budhiabako . . . Name of a variety of paddy in the C. P.

Bhusa . . . . The husk or the chaff of grain ; the straw.

Bilichigan . . . Name of a variety of *jowar.*

Boro . . . . Summer rice (Bengal).

Chhola . . . . Gram (*Cicer arietinum*).

Chikta . . . . A physiological disease of *jowar.*

Dalua paddy . . . Summer paddy.

Desi . . . . Indigenous.

Dorsa soil . . . A heavier type of soil in the Central Provinces with about 48 per cent of clay.

Gosaba . . . . A variety of rice in Bengal.

Gowallas . . . Milkmen.

Gowshalla . . . Cow-shed ; Refuge home for cattle.

Gooty . . . . A new plant prepared by inducing rooting of a shoot by air layering.

Guara . . . . *Cyamopsis psoralioides ;* a *kharif* leguminous crop.

Gundhi . . . . *Leptocorisa varicornis*—an insect which attacks paddy flower.

Gur . . . . Unrefined Indian sugar ; jaggery.

Gurmatia . . . A variety of rice in the C. P.

Hookah . . . . Indian smoking pipe.

Jhanji . . . . Algal weed.

Jhil . . . . Small lake.

Jowar . . . . Sorghum (*Andropogon Sorghum*).

Kajazi . . . . Variety of lemon (*Citrus medica*).

Kans . . . . A coarse deep-rooted grass weed. (*Saccharum spontaneum*).

Khand . . . . Sugar.

Khandsari . . . An open pan boiler in sugar industry.

Kharif . . . . Crops sown at the beginning of the rains and reaped from October to December, also applied to season.

Khesari . . . *Lathyrus sativa.*

Kiaries . . . . Beds.

Litchees . . . A fruit (*Nephelium lappaceum* linn.).

Luchai . . . . A type of paddy in the C. P.

Malta . . . . Malta orange (*Citrus aurantium sinense,* Gallesio).

Matsai soil . . . A type of light soil in the C. P.

Meth (or *Methi*) . . *Phaseolus aconitifolius.*

Misri . . . . Sugar candy.

Mosambi . . . Corruption of mozambique—a variety of orange.

Muddinandyal	A type of *jowar*.
Nagkesar	A variety of paddy in the C. P.
Neem	*Azadiracta indica*.
Ord (or *urd*)	*Phaseolus mungo* Var Roxburghii.
Pan	Piper beetle.
Papaya	A fruit (*Carica papaya*).
Parewa	A variety of rice in the C. P.
Patnai	A name given by commerce to a certain type of rice grown chiefly in Bengal and Bihar.
Patwaria	Name for late varieties of sunn in Bihar.
Peepal	*Ficus Religiosa*.
Rab	Massecuite.
Rabi	Crops sown in the autumn and reaped at the end of the cold weather; also applied to the season.
Rani *jowar*	A type of *jowar*.
Raya	*Brassica juncea*.
Sanai	*Crotalaria juncea*.
Sann	*Crotalaria juncea*.
Santra	Orange.
Sarson	*Brassica campestris* var. *sarson*.
Sathi	A coarse variety of rice the flowers of which are enclosed inside a sheath.
Shevri	*Sesbania aculecata*.
Shisham	*Dalbergia sisso*.
Siroo grass	A type of grass in the U. P.
Surra	Bovine trypanosomiasis.
Toria	*Brassica napus* var. *dichotoma*.
Vayupotlu	Rheumatic pain.

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